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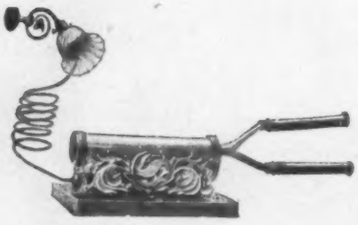

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INTERESTING AND UNIQUE GERMANY MERCURY VAPOR LAMPS

By Frank C. Perkins.

One of the most interesting and unique mercury vapor lamps constructed in Germany is that of Schott & Genossen, of Jena, shown in the accompanying illustration, Fig. 1, where four of the lamps are used for the illumination of a machine shop, with excellent results. The Hageh mercury vapor lamp is also employed extensively in Germany, for photographic studio service, no daylight being required.

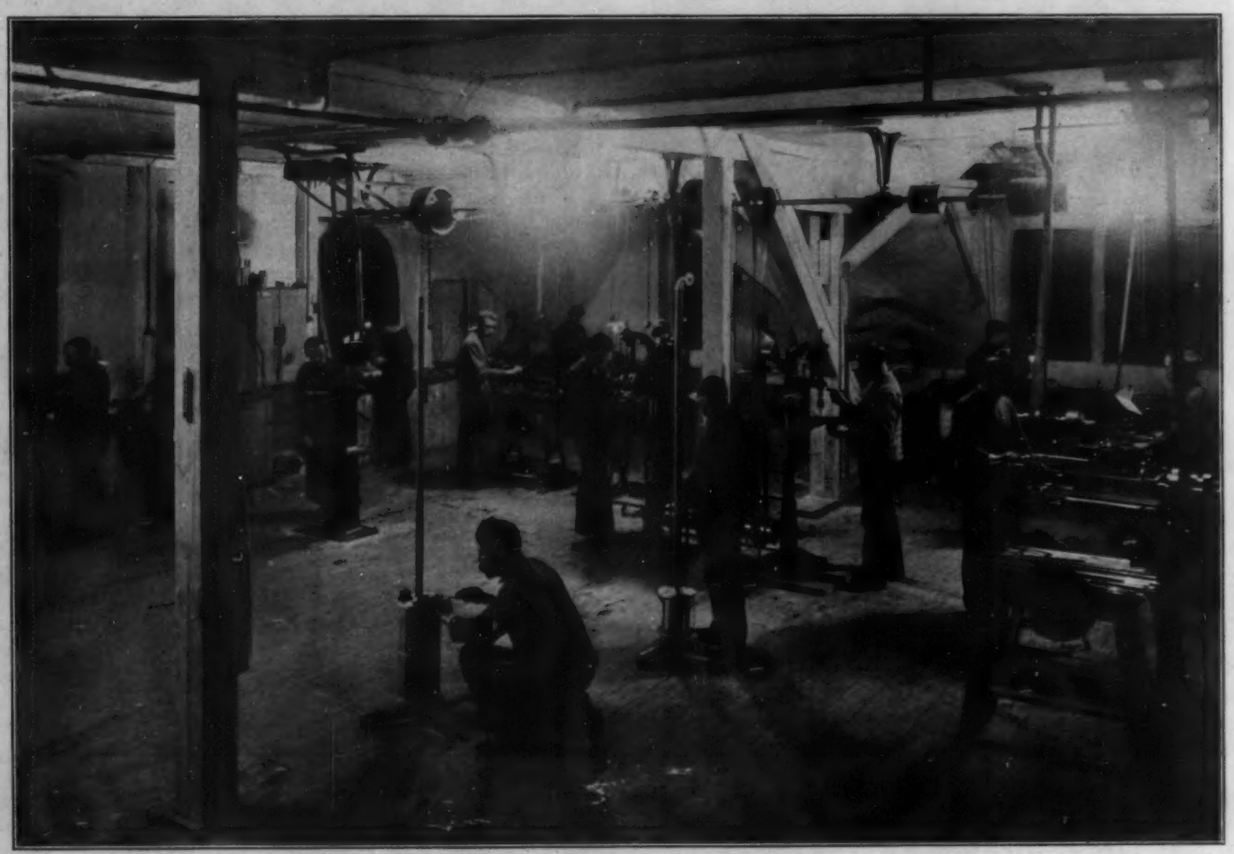

FIG. 1. FOUR HAGEH-ATELIER MERCURY VAPOR LAMPS LIGHTING WORKSHOP

The glass tubes of the Hageh vapor lamps are twenty-two millimeters in diameter, and forty, sixty and ninety centimeters in length, and operate on 110-volt circuits and 200 to 250-volt circuits. The six-lamp standard mercury lamps weigh fifty-seven kilograms, the height being 250 centimeters. The four-lamp standard with lamps weighs forty kilograms, and measures 175 centimeters in height. The photograph of the machine shop noted was taken by means of the mercury vapor lamps in use at the time by the men working at night, and it is stated that for this class of service this form of light is well adapted.

The accompanying illustrations, Fig. 2, show the details of construction and the method of mounting, with hanging, bracket and other forms of standard electric mercury vapor lamps which are of German construction, as well as the rheostat employed in connection with the operation of the same, as designed by Hans Boas, of Berlin.

These German quicksilver lamps are employed largely in German drafting rooms and shops, for lighting service, and are said to be particularly well adapted for this work, being restful to the eyes, supplying an abundance of light for even

the closest work, and being economical in operation.

As in American photo-engraving establishments, this form of lamp has been used extensively in place of the focusing arc lamp, so in German photographic establishments, as well as photo-engraving rooms, the type of lamps shown in the illustrations have been utilized to advantage. The light is from seven to ten times as brilliant as an ordinary incandescent lamp, and three of four times greater than the Nernst lamp, while it is said to be at least three times the brilliancy of the Osmium lamp, and in some cases double the illuminating power of the ordinary arc light. The current consumption is said to be .5 watts per candle, the efficiency only being approximated by the other highest efficient electric light, the new flame lamp coming the nearest to the efficiency of the mercury lamp. For portrait work, from two to three lamps are employed, operating either singly on the 110-volt circuit, or two lamps in series on 220 volts, while these German lamps have also been constructed for operating separately on the 220-volt circuit, an adjustable rheostat being utilized as

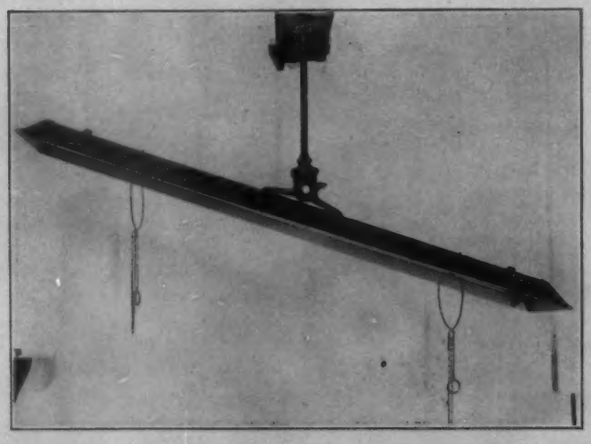

FIG. 2. HANGING MERCURY VAPOR LAMP

shown in the accompanying illustration, which can be connected for operation with any of these three methods. The current utilized with the 50-volt lamp is four to five amperes, the lamp burning warm and emitting a whiter light than with the 50-volt current above mentioned, when the lamp burns practically cold.

With normal operation of seventy-five volts a current of from 2.8 to 3.5 is utilized, the lamp producing the full candlepower with the normal temperature.

These German lamps, designed by Hans Boas, are one meter long, and are constructed of glass tubing three-eighths of an inch in diameter. In order to increase the candlepower for photographic work, where large areas are to be lighted, double lamps are provided in the same frame, operated on 220 volts. The standard upon which the mercury lamp is mounted is adjustable, so as to be turned in any direction, reflecting the light as desired, and the hanging lamps are also provided with a tilting device, which can be manipulated by means of the chains shown in the illustration.

According to a special report issued by the statistician of the Census, it appears that California, with a population of less than 1,500,000, has a total wealth of $4,200,000,000. To give meaning to these figures it may be stated that France, with a population of 38,000,000, has a total wealth about ten times as much, and Germany, with 52,000,000, is only nine times as rich. The wealth per capita is $1,125 in the United States as a whole, $1,455 in Great Britain, $1,228 in France, $751 in Germany, $1,247 in Australia and $2,800 in California.

DIRECT CURRENT FROM ALTERNATING CURRENT: THE MERCURY RECTIFIER.*

By Frank Conrad.

Within the last few years considerable attention has been paid to the development of the mercury rectifier for converting alternating into direct current. As it is apparent that this device is to play an important part in the betterment of central-station economics, a description of some of the latest developments in this line may be of interest at the present time. The rectifier in its usual form consists of a glass bulb containing two positive electrodes, or anodes, and one negative electrode, or cathode. The bulb is exhausted to a high degree of vacuum and sealed. The anodes are connected to the terminals of the transformer supplying the alternating current, the connections for the direct current supply being made between the cathode of the bulb and the middle of the transformer winding. During one-half of the alternating-current cycle current flows from one of the anodes through the bulb to the cathode through the direct-current load to the middle point of the transformer. During the next half of the cycle the polarity of the transformer terminals is reversed and current flows out of the other anode through the cathode to the load. The positives, due to their surface electrode resistance acting as valves, allow the current to flow out, but not in a reverse direction, the resistance of the negative terminal being broken down by the starting operation, so that current can flow into that terminal only. Should the current be interrupted for an instant the negative resistance will reassert itself and the rectifier will require restarting. Therefore, to bridge over the neutral point of the alternating-voltage wave it is necessary to give the direct-current circuit a certain reactance which will store up sufficient energy to maintain the current flow over the zero of the alternating-current voltage.

The negative electrode resistance or valve action of the electrodes is not an absolutely rigid condition, but is influenced in a number of ways, chiefly in the shape of the containing bulb and the temperature at which it is operated.

To obtain a minimum loss in the bulb, the path between the electrodes should be as short and direct as possible. With a short, direct path, especially at high temperatures, there is a tendency for the electrode resistance on the positives to break down—or, in other words, for the bulb to short-circuit. This may, in a measure, be overcome by operating the bulb at low temperatures, and to obtain this condition it is necessary either to give the bulb considerable radiating surface or resort to artificial cooling. The preferable way, especially for high voltage, is to cool the bulb by immersing it in oil contained in a tank having a comparatively large radiating surface. By this means it is possible to use a construction that will give a minimum of loss and still be free from any tendency to short-circuit.

The voltage to be applied across the positive terminals is determined by the direct-current voltage required and the losses in bulb and auxiliary apparatus. As current is drawn from one-half of the transformer winding only, the direct-current voltage will be one-half the total alternating-current voltage. In addition to this, as the direct-current voltage is the average of the rectified alternating-urrent waves, while the value of the alternating-current voltage is expressed as effective, it will be reduced by the ratio of the average to the effective, which in a sine wave is 0.9.

The voltage of each half of the auto-transformer in an outfit delivering 110 volts direct current would be 100 plus the loss in the bulb (approximately 15) plus the loss in the choke coil (approximately 4) divided by 0.9, a total of 143, or approximately 286 volts across the anode terminals of the bulb. A reactance is placed in the direct-current circuit to give the necessary bridging over the zero point.

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*Extracts from a paper read before the National Electric Light Association, Washington, D. C., June 4.

To put the outfit in operation it is necessary to break down the electric resistance of the cathode. This is accomplished by a small arc produced between the mercury forming the cathode and that in a small auxiliary electrode. The bulb is tilted so that the mercury in the two electrodes makes contact, thus closing a local circuit which at the break produces the small arc necessary for starting. The efficiency of an outfit of this character is high compared to that of a small motor-generator set. It is determined mostly by the voltage of the direct-current circuit, as the voltage loss in the bulb is practically constant, irrespective of the total voltage of the circuit or the current delivered. As stated before, the loss in the bulb amounts to about 15 volts; therefore, to obtain 110 volts direct current the voltage of the transformer should correspond to a direct-current voltage of 125; the efficiency of the bulb thus would be $\frac{110}{125}$ or 88%. With an efficiency of the transforming apparatus of 90, the net efficiency of conversion from alternating to direct-current would be over 79%. The Efficiency of a small motor-generator set would probably be 60 to 65%. The power factor of the outfit, when used without adjusting the reactance in the alternating-current circuit, would be about 90%. When used with this reactance it will, of course, be lower. It should be possible, however, to operate with a power factor of 80%.

As to the general operation and efficiency of the rectifier outfit, the results obta'ned are far superior to that of a constant-current generator. The percentage of loss in the bulb is practically zero, amounting to less than one per cent in an outfit supplying 50 arc lamps. The losses in the regulating transformer and reactance will total about 80% more, which will give a total efficiency of conversion from alternating to direct current of about 90%.

ELECTRIC VENTILATING FANS.

To be successful, ventilation must be positive. Natural means may serve at some seasons and under some conditions, but mechanical means are always to be relied upon. Even on the high seas where the breezes blow free, the old time ventilator funnel is giving way to the compact and adaptable fan blower. A wonderfully complete installation was made on the recently completed U. S. Battleship "New Hampshire," which is equipped with no less than twenty-five electrically-driven fans of varied types and sizes. These are scattered all over the ship, being applied for boiler and engine room ventilation, for renewing the air in cabins, mess rooms and holds; in fact they have been placed with the utmost ease just where they were wanted.

The small fans with cast iron casings are driven by bipolar motors, while the larger fans of steel plate construction have four-pole or eight-pole motors. All the fans are so made that they may be adjusted to discharge in any direction by slacking the nuts and turning the casings. For fire room service the motors are of the enclosed type to prevent damage from dust in the air; for general ventilation in other parts of the ship they are of the semi-enclosed, or of the open type. The motors are so designed that there is an allowance of 20 per cent field variation below the maximum speed.

What is here done on shipboard is only suggestive of the much more extended usefulness of the electric fan on land. It can be placed anywhere and arranged to force fresh air into a room, or withdraw the foul air from it. By means of suitable hoods the ventilation may be rendered absolutely local. Odors, vapor, and heated air may be drawn directly away from the kitchen range; the dye house vat, the paper machine, and the steaming kettle may be in like manner rendered inoffensive; from the emery wheel and the tumbling barrel the dust may be completely removed, and the planing mill kept clear of shavings. In a word, with a fan the air is made to move regardless of wind and weather, and with an electric fan the operation is simplicity itself.

SEASONING OF TELEPHONE AND TELEGRAPH POLES.

The scarcity of timber suitable for telephone and telegraph poles has of late assumed serious proportions. To users of poles, therefore, the question of how best to meet this situation is of first importance. Latest reports of the Census Office show that there were in operation in 1902 approximately 700,000 miles of pole line. Subsequent additions, however, together with certain railroad pole lines not reported, would enlarge this figure. It is safe to assume that there are in operation at present fully 800,000 miles of line. The average line contains about 40 poles per mile, so that there are approximately 32,000,000 poles in use. Assuming that the average life of a pole is twelve years, it follows that for the maintenance of the lines now in operation there are needed each year more than 2,650,000 poles. Such an enormous demand must soon deplete the available supply. This is fully recognized by the different companies.

The experiments which are here described were conducted in cooperation with the American Telephone and Telegraph Company, by the Forest Service under the supervision of Henry Grinnell, and are among a number carried on by the Forest Service to determine the best means of prolonging the length of service of poles and other timbers, to the end that the number required each year for repair and maintenance may be reduced and the overcutting of the forest checked.

In Bulletin 41 of the Forest Service the seasoning of timber is discussed in detail, and it is shown that seasoned timber in contact with the ground will outlast unseasoned, and that dry wood is more receptive of preservative fluids than green wood. The results of the experiments indicate very clearly that definite laws regulate the seasoning of timbers. These experiments, however, were concerned especially with the seasoning of ties. Regarding the time required to season poles to an air-dry condition there has been a wide difference of opinion. To answer this and other related questions the Forest Service undertook the present experiments in the sesoning of poles of two important kinds of wood.

The tables contained herein have been compiled from data collected since 1902. Though the experiments have not been carried far enough to admit the formulation of definite laws, the results are sufficiently clear to form the basis of some important conclusions.

Questions Involved in the Experiment.

The questions involved in experiments to prolong the length of service of timbers fall naturally into two groups: (a) those which pertain to the rate of seasoning and (b) those which pertain to the preservative treatment and durability. The present article deals only with those forming the first group. Those taken up are:

(1) At what rate does seasoning progress in telephone poles?

(2) Does the time of year when timber is cut affect its seasoning?

(3) Does the time of year when timber is cut affect its specific gravity?

(4) How much shrinkage occurs in air-seasoning?

(5) What are the causes of the checking of poles during air-seasoning?

(6) What is the best season for cutting poles?

All poles are peeled immediately after being cut, and are then hauled or rafted to the seasoning yard, where they are skidded in single tiers about 2 feet above ground.

As soon as possible after being placed on skids each pole is numbered, its weight taken, and its circumference at 6 feet and at 30 feet from the butt (or 25 feet in the case of the shorter poles) recorded. Weights and measurements are taken about once a month until the poles had practically ceased to lose weight. To determine the volume, weight per cubic foot, and specific gravity of the poles, a

series of circumference measurements are made at the butt, at successive 5-foot points, and at the top.

Although poles are cut in all twelve months of the year, it has been thought best in grouping the results to classify them as spring, summer, autumn, and winter cut, beginning at March 1. The tables show the average weight per cubic foot at the time of cutting and at subsequent seasoning intervals. The weight per cubic foot is found by dividing the weight of the average pole by its volume, which in turn is calculated from the average of the circumference measurements and from the length. The weight of the average pole at each seasoning stage may be found from the tables by multiplying the weight per cubic foot at the desired time by the volume of the pole. The dry weights of cedar and chestnut wood used in the computations are those given by Sharpless, in Vol. IX, Tenth Census.

The results of seasoning cedar poles from ten to seventeen months show that poles cut in autumn and winter weigh more per cubic foot when they came out of the water than those cut in spring and summer, and thus have to lose more water before reaching dryness. It is also a fact that spring-cut wood continues lightest as long as weighing is continued. At the end of six months, however, the difference between the spring and winter cut is insignificant. In a carload of poles it would amount to only about 250 pounds.

While the winter-cut poles contain a greater amount of water at first, they season most rapidly and regularly after the first month and show increased loss of moisture each month until practically air dry. In the autumn and spring cuts the drying is continuous, but less regular, while in the summer cut, after three months, an increase in water content begins, and continues till about the ninth month.

Consequently, poles cut in spring contain less moisture than those cut at other seasons, and continue lighter throughout. Winter-cut poles, although heavier when green, dry out faster than those cut in other seasons, but never catch up with the spring-cut poles. Summer-cut poles dry out rapidly for the first few months, but drying ceases with the approach of winter, and the weight is not further reduced until the following spring.

The following statement shows, for conditions corresponding to those of the experiment, the length of time poles cut in the different seasons should be held before shipment to secure the lowest freight charges and at the same time minimize insurance and storage charges:

	Months.
Winter cut	4 to 6
Autumn cut	7 to 9
Spring cut	3 to 5
Summer cut	2 to 4

Air-dry weight of cedar is from 65 to 70 per cent of green weight, and an air-dry cedar pole contains about 20 per cent of moisture.

While there is but little, if any, difference in the specific gravity of pure wood substance or cellulose, regardless of the kind of tree, the specific gravity of wood as found in the tree varies considerably. Density, or the closeness with which the fibers are compacted in growth, affects specific gravity. The amount of water contained affects it greatly, and similarly its content of minerals, resin, or oils. These all affect specific gravity directly. Other things operating through these exert an indirect influence. Age influences the moisture content. Season varies the moisture content, and perhaps also the content of albuminous matter. Soil and climate influence both the density of wood and the substances it contains.

For the reasons just set forth, there may be considerable variation in the specific gravity of timber cut in any particular locality. For instance, young, thriftily grown timber cut in summer might easily have a greater specific gravity than old timber cut in winter; but in timber of approximately the same age and growth, that cut in winter would usually be heaviest, that in spring and summer of about the same weight, with the difference, if any, in favor of the summer cut, and that cut in autumn lightest.

Trees normally contain the greatest amount of water during that period when the roots are active and the leaves not yet out. In climates like those in which these experiments were made root activity commonly begins in January, February, or March, the exact time varying with the kind of timber and the local atmospheric conditions. The results also indicate that green wood becomes lighter in late spring or early summer, when transpiration through the foliage is most rapid. The weight at any season, however, is doubtless much influenced by the amount of moisture in the soil.

The results are in accordance with those obtained by Robert Hartig in his investigations of the specific gravity of wood cut at different times of the year. From a careful study of 30 different species of trees, practically all of the same age (16 years), which he grouped into three classes, he found, by eliminating as far as possible all variables other than the one under investigation, that the specific gravity varied materially with the season.

The water in green wood is contained in the cell cavities, in inter-cellular spaces, and in the cell walls. When green wood is exposed to the air, the water it contains begins to evaporate. The amount and rapidity of evaporation depend upon the length of time the timber is exposed, the amount of water in the wood, and the heat and dryness of the surrounding air. By far the greater part of the water evaporated during air seasoning is that from the cell cavities and intercellular spaces. Since the water contained in the cell walls is not greatly reduced, the shrinkage during air seasoning is very little. As soon, however, as wood begins to lose water from its cell walls, shrinkage commences, and continues as long as the amount of such water is reduced.

Shrinkage in wood may be distinguished as longitudinal, radial, and tangential. Longitudinal shrinkage (in the direction of the length of the fibers) is practically inappreciable; radial shrinkage (in the direction of the radius) is from 4 to 6 per cent; and tangential shrinkage (in the direction of the circumference) is about double the radial. In round timbers, such as telephone poles, shrinkage can best be determined by measuring the circumference.

From thousands of measurements made on telephone poles during this experiment, it was found that shrinkage was so slight as to be almost negligible.

All wood when undergoing a seasoning process, either natural (by air) or mechanical (by steam, kiln-drying, etc.), checks or splits more or less. This is due to the uneven drying out of the wood and the consequent strains exerted in opposite directions by the wood fibers in shrinking. There is more checking in the wood of broadleaf trees than in that of coniferous trees, more in sapwood than in heartwood, and more in summer wood than in spring wood. Inasmuch as under normal conditions of weather water evaporates less rapidly during early seasoning in winter, wood cut in autumn and early winter is considered less subject to checking than that cut in spring and summer. Rapid seasoning, except after wood is soaked or steamed, almost invariably results in more or less serious checking.

The worst checking during seasoning experiments occurred at the Pisgah, N. C. station, where the poles were cut from comparatively young, rapid-growing trees. The trees were felled with axes and the chopping was carelessly done, so that in many cases the butts and tops were somewhat ragged and at times split. During seasoning, especially in summer, many of these poles checked and split badly at

the butt and top, and in some cases pieces of wood of a width of several inches and of a depth of three to six annual rings curled up from the ends of the poles for a distance of several feet. Such pieces or slabs separated along an annual ring from the remainder of the pole, the point of separation being between the summer wood of one year's ring and the spring wood of the next. Had these poles been more carefully chopped or sawed the checking would probably have been slight.

Winter cutting of poles has long been the general rule, since conditions continue to make it the best and cheapest season for the logger. Moreover, sap contains fewer nitrogenous substances in winter than at other seasons, and since fungi obtain much of their food from these substances winter-cut timber is least liable to attack from this source. Nor does the harder and denser wood found in summer and early autumn afford fungi as good a chance to lodge and develop as the undeveloped wood, immediately under the bark, which forms in spring and early autumn. Again, winter-cut poles season more gradually, and at that time of the year the wood fibers shrink more uniformly, and checking is less serious.

Winter at the experiment stations where chestnut was cut is usually cold, with more or less snow, while summer is warm and comparatively dry. The effect of such a climate upon the seasoning of poles is that from the time of cutting until approximately air dry, winter-cut poles lose water steadily; poles cut in autumn pass, during winter, through a period of comparatively slow seasoning, while spring and summer cut poles are completely stopped in their seasoning during cold weather and frequently even absorb moisture.

Though in nearly all cases winter-cut wood is heavier than wood cut at other seasons, yet after six or eight months' seasoning under ordinary climatic conditions it so nearly approaches the weight of the lightest that the difference in shipping weight is practically negligible.

In short, seasoning does not in itself, at least under the conditions which accompanied these experiments, furnish a conclusive argument for cutting in any one season, so that the practical considerations in favor of winter cutting are of determining importance.

DENATURED ALCOHOL REGULATIONS.

The Commissioner of Internal Revenue has issued the amended denatured-alcohol regulations, which, on September 1st, will take the place of the regulations heretofore issued. Under the new regulations, in addition to denaturing warehouses on distillery premises, central denaturing warehouses may be constructed at such points as business interests may require, and alcohol may be transferred from denaturing warehouses, by means of tanks or tank cars, to consumers.

Manufacturers using completely denatured alcohol are not required to swear to an application for permit. Industrial or farm distilleries may produce alcohol from anything that contains fermentable matter. Industrial distilleries are divided into two classes. In the first class are placed distilleries of a surveyed capacity of fifty proof gallons. Distilleries of the second class are those that produce more than fifty gallons and less than one hundred gallons of distilled spirits daily.

Manufacturers using specially denatured alcohol are, under the new regulations, relieved from keeping a record of the goods in the manufacture of which denatured alcohol is used.

ELECTRICAL CO-OPERATORS' CREED.

The nine winning contributions in connection with the prizes offered by the Co-operative Electrical Development Association for an electrical co-operator's creed are printed herewith. A further prize has been offered to these nine winners, for the preparation of a further creed—each having the advantage of the work of all the others:

By Chas. A. Parker.

I believe in Electri-city—the greatest "city" on earth.

Daughter of Science and Mother of Progress.

Sister of Civilization, Handmaid of Industry and First Cousin to the Spirit of Peace on Earth and Good Will to Man.

Lightener of Burdens, Tamer of Wilderness, Annihilator of Distance and Goddess of Light.

The most necessary of luxuries.

The most luxurious of necessities.

Who wouldn't believe in Electricity?

I believe in Co-operation.

Pennant-winning "team work," rather than individual grand-stand play.

Constructive and profitable combination as opposed to destructive unprofitable competition.

Greater general progress through reduction of individual friction.

Working together for the Grand Prize instead of quarreling together over scanty profits.

Co-operation! Who wouldn't be a Co-operator?

I believe in Electrical Co-operation.

"All together all the time for everything electrical." The application of the Highest Law of Modern Business to the Greatest Business of Modern Times.

The massing of forces to boost the sale of current and everything under Heaven that uses current—the Generator of an enlightened "Current Opinion."

The step-up Transformer of low-efficiency selfishness to high-voltage helpfulness—the Incandescence of Enthusiasm against the resistance of Conservatism, and the Short Circuit to the final and complete Electrification of the Universe, and to that Millenium Age when what isn't done by electricity won't be done at all.

By Frank B. Rae, Jr.

I believe in co-operation.

I believe that if one-half the time, labor and money now spent in commercial strife within the electrical trade were turned to account in combating the natural competitors of the trade as a whole—if but a small amount of the energy now dissipated in fighting for the business that exists, were devoted to the creating of new business, it would redound to the advantage of all.

I believe that this great advantage to all cannot be secured without the sacrifice on my part of certain small advantages, the burying of certain animosities, and perhaps the loss of certain immediate gains; nevertheless, I believe I am sufficiently broad-guaged and far-sighted to forego the lesser advantage for the greater.

I believe that this can be done without the submerging of my individuality or the loss of any material advantages which I will get back many fold, and of petty pride which I can well afford to be without.

I believe the time for co-operative action is here. I am ready if you are.

By Paul Lupke.

I believe that my first duty is to care for those who are dependent upon me. I believe that to fulfill that duty faithfully under present social conditions I must avail myself of the help of my fellows, and I believe that to secure that help fairly I must extend it as freely as I ask it.

I believe that the existing complexity of interests compels me to single out one and to work for that interest with unvarying fixedness of purpose.

I believe that in doing this, and to be a man among men, I must rise above nagging and knocking, small jealousies, petty wrangling and tainted competition.

I believe that my individual advancement is linked with unseparable ties to the advancement, as a whole, of the interest I have chosen to represent and that whatever I can do to further that interest must invariably further my own.

I believe that success and prosperity are natural conditions, that failure and commercial calamity are unnatural and man-made and that I must preach and act success and prosperity with unfaltering cheerfulness.

I believe that true contentment can be gained only through the consciousness of work well done and that, since my chosen interest is Electrical Development, I must unite with my fellows in working, "All together, all the time, for everything electrical."

By Lewis L. Brastow.

I believe in the Cause, in its present worth and future greatness.

I believe in the man who represents it.

I believe that the Co-operation of such men in such a Cause divides the load and multiplies the power, that it carries its message faster, serves its public better, and gains for each a larger share in the merited reward.

I further believe that lack of Unity means waste of energy, weakened effectiveness and narrowing horizon.

I believe in hard work, in cheer, in loyalty, in honor, in intelligent work and that enthusiasm for the common good which willingly divides and eagerly assists.

I believe in our motto and that in the spirit of "All together all the time," the standard which we hold, we cannot fail to win the Cause for Everything Electrical.

By S. M. Kennedy.

I believe that in the civilized world today electricity is the greatest agent for doing the greatest amount of good to the greatest number of people.

I believe that in advocating the use of electrical service I am helping to make life more cheerful, hopeful, healthful and useful for all classes of people.

I believe it is desirable to take advantage of every opportunity to increase the sale of electrical energy, and that co-operation points to many opportunities for the use and development of electrical service which might not be discovered by individual effort.

I believe that every man engaged in the electrical business knows something about it which I do not know, but which I would be the better for knowing. I believe that co-operation is the best means for me to obtain such additional knowledge.

I believe that the true interests of electrical distributing companies and manufacturers of electrical appliances are identical with the interests of consumers, and that co-operation is essentially to the advantage of all.

I believe that the co-operation of the public is necessary for the permanent up-building of a distributor's business, and that this co-operation can only be obtained by means of good service, square dealing and courteous treatment.

I believe in the efficacy of individual effort, and that the way to obtain the fullest advantage from individual effort is by co-operation.

I believe that the best test of all work is results, and that in the co-operation of individuals, corporations and associations towards a common end, the highest results are assured.

I believe that the chief aim in my daily work is success, and that co-operation will help me make the victories of today the stepping-stones for the achievements of tomorrow.

I believe in the potency of persistent labor, and that in order to enjoy the full fruits of my labors, I must be a co-operator with others who are working along similar lines.

I believe that the time to co-operate is now—and always.

By Richard E. Brown.

I believe in electrical co-operation, in its soundness, its wisdom and in its value to my associates and myself, individually and collectively.

I believe in the more extended use of the electrical current by the public for light, heat and power, and that through co-operation this result can be best obtained.

I believe that the interests of the allied electrical industries are my interests; that I am best serving myself by co-operating with them to the best that is in me.

I believe that I cannot know too much about things electrical; that the individual who daily acquires some fresh knowledge, who makes some little advancement each day, is the man who in the end comes to the top, and that co-operation is the means to the end.

I believe that the interchange of ideas, experience and suggestions is bound to be of mutual advantage; that men succeed only as they utilize the ideas and services of other men, and that co-operation is the key-note of success.

I believe in the necessity of harmony and in the loyal and hearty support of every man connected with the electrical industry to the principles of co-operative work.

I believe that co-operation means education, progress, efficiency and prosperity.

I believe that in unity there is strength, both individually and collectively, and that success will come by working "All together all the time for everything electrical."

I believe that co-operation is the most effective way to secure the most of what each one desires to obtain.

I believe in electrical development through co-operation. Therefore, I will be a co-operator.

By Chas. W. Lamb.

I believe that two horses can pull a bigger load than one. Same with men.

I believe that two men can do more by pulling together at the ye-o-ho than by pulling apart. I believe in the ye-o-ho.

I believe that I know a good deal, but some other man knows something I don't know. I can use that something.

I believe that a wise man learns from everybody, and shares his wisdom to get more.

I believe that the more people know of electricity and its appliances, the better they like it. I believe in teaching them.

I believe that most doors open inward. Therefore in PUSH.

I believe that the electrical business is interdependent, and co-operation is the key-note.

I believe in sense, sand and suavity—in treating my customer as an intelligent gentleman. Then he will discover that

I'm one.

I believe in giving my co-worker in the electrical field the glad hand of honesty and help and in grasping his as heartily.

I believe that the only pull is pulling together—"All together all the time for everything electrical."

By J. R. Cravath.

I believe that co-operation is to be the life of the electrical trade.

I believe that more electrical supplies and current can be sold by boosting everything electrical everywhere, all the time with emphasis on my own goods, than by knocking the other fellow's goods to sell mine.

I believe that electric light and power service ought to be used much more than they are and for more things than they are.

I believe that the first thing for every electrical man to do is to set the example by using all of these electrical necessities, conveniences and luxuries himself and then to talk about them to his lay friends.

I believe that until electrical men make daily use of these conveniences, they are talking from a second hand knowledge only and are not likely to enthuse the public much about them.

I believe that it is only by pushing that the general public can be brought to appreciate and use electrical conveniences, and that this pushing should be done by electrical men all together all the time.

By Hugh A. Brown.

Whereas, A single ampere turn of wire on an iron core will produce but a very insignificant magnetic attraction, though the ampere turn is the fundamental unit of the most powerful magnets; and

Whereas, A single incandescent lamp would look pale and lonesome if used alone to light a ballroom hall, though the incandescent lamp is the fundamental basis of the most brilliant and successful ballroom illumination; and

Whereas, A single arc lamp applied to the lighting of a city's streets would be practically useless in preventing the after darkness crimes of metropolitan life, though a sufficient number burning in unison throughout the night lend the safeness of day to a city night; and

While, A single ton of coal, a single boiler, a single engine, a single dynamo, or a single electric car may be hopelessly inadequate to move the passenger traffic of a city's streets, yet the traffic of the streets of many cities is being smoothly and quickly moved by the combined united efforts of many such units.

Hence, it is evident: That what is true of the physical forces, which we direct, and of their application to the arts and inventions, which reflect ourselves in nature, is equally true when applied to our own efforts, and not only corroborates the national axiom, "In Union there is Strength," but evolves the commercial corollary, "In co-operation lies comprehensive success."

Therefore, be it resolved: That we believe in co-operation as the natural supplement of individual effort.

That what benefits one in the electrical profession raises the general average of success to all.

That our own success and happiness in life depends largely on the success of those associated with us, and,

That everything we do which promotes the interest of the general profession, and the business whereby we gain our livelihood, is indirectly a step in the promotion of our own personal welfare.

MEASUREMENT OF HIGH POTENTIALS.

By Wm. Bradshaw and H. W. Young.

The trend of modern development in electrical transmission of power towards high pressure has produced a need for some convenient and accurate method of high potential measurement. That dynamos, transformers, switches, cables, insulating materials and insulators be tested at potentials many times higher than normal is generally a specified condition of acceptance, and discussion sometimes arises as to whether or not the proper pressure has been applied. In experimental work in laboratories it is also necessary that the measurements be reliable and accurate.

Many different methods of measuring high voltages have been used heretofore, but each has its disadvantages. A brief outline of the more familiar methods will be given, together with description of a new design of electro-static voltmeter suitable for measuring potentials from 10,000 to 200,000 volts.

Spark Gap Method.—The well known spark gap is simply a weak point of approximately known value in shunt with the apparatus under test, and the voltage is increased until the weaker path breaks down. This method cannot be used where it is desired to measure the voltage by steps or where it is necssary to hold a particular value for a certain length of time. The system is rendered unreliable owing to the fact that the form of the wave has a great influence on the disruptive distance, and it is not always possible to tell how the capacity of the tested object alters the wave form.

It has also frequently been demonstrated that during the breakdown period of a spark gap test, oscillations and surges of extremely high frequency and magnitude may easily exist, and the subjecting of apparatus to such strains is undesirable, to say the least. The extent and value of these superimposed oscillations seem to vary with the operating voltage, volume of current passing the gap, and the capacity constants of the apparatus being tested. A method of minimizing these strains has been to use high resistances in series with the spark gap, thus limiting the discharging current to a comparatively low value, but owing to the variable nature of the resistances usually employed, local conditions, etc., it is extremely difficult to even approximately maintain constant conditions.

Another disadvantage of the spark gap method is that the needle points are destroyed, and it becomes necessary to reset the gap with new needles after each test, since the slightest arc will tend to change the initial relations of the gap, and, therefore, the breaking down point. Although apparently a simple device, the spark gap requires an expert operator to secure results that are at all satisfactory.

Ratio Method with Step-Up Testing Transformers.—The high pressure voltage value is obtained by measuring the pressure of the low voltage side of the testing transformers with a low reading voltmeter and multiplying this measurement by the ratio of transformation. This is the most convenient method of high pressure measurement, but it open to objection in that serious errors are easily introduced by errors of transformation which, in addition to the inherent ratio error, is also subject to change with variations in transformer regulation with loads of different values.

Ratio Method with Step-Down Transformers.—The use of an auxiliary transformer to reduce the high voltage to a value suitable for ordinary low voltage instruments has been found quite successful within a certain range of pressure, but the limits of its usefulness are now reached with increasing voltages on account of the size of transformer required, which entails a necessarily high cost, especially as the voltage is increased and also prohibits its use as a portable unit.

Results obtained by the voltmeter transformer are resonably accurate over certain parts of the voltmeter

scale, but if accuracy over a greater range is desired it is necessary to change the ratio of the transformer for the low pressure value. This method finds its widest application in switchboard service where the pressure range is limited and the high pressure side of the transformer is not more than 15,000 to 20,000 volts.

Voltmeter Resistance Method.—An extension of the well known plan of using extra resistance as a multiplier for a voltmeter in order that it may be used on a circuit of higher voltage than that for which it was designed has been employed for potentials up to 150,000 volts. Such a resistance can be made practically free from inductance, but is subject to capacity action between parts and to ground and surrounding objects. The capacity currents may cause the voltmeter to read high or low, depending on its position in the resistance circuit. The resistance required is, moreover, bulky and difficult to mount.

Voltmeter Coil Method.—Special coils have been placed in the high pressure circuit of the transformer in an endeavor to have them linked with the same magnetic flux as the high pressure winding, and thus give an accurate and constant ratio. This method has met with only limited success, and is but slightly, if any, more accurate than the ratio method from the low pressure side. It is subject to certain errors on account of the lack of uniformity of pressure induced per turn, due to the leakage flux affecting some parts of the windings more than others.

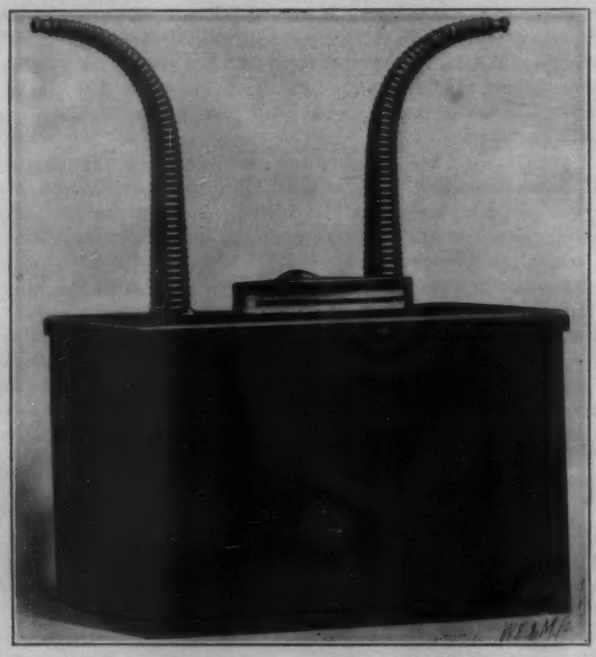

FIG. 1. COMPLETE ELECTROSTATIC VOLTMETER

Measurement Across Part of the High Tension Winding.—This method is quite similar to the one using voltmeter coils. If such measurements are made over symmetrical portions—like one-half or one-quarter of the winding, according to the individual case—very satisfactory results will be obtained.

Other methods for measuring high potentials have been used, but to such a limited extent that they will not be considered.

The Electro-Static Voltmeter Method.—The ideal and theoretically correct method of high pressure measurement is that employing an electro-static voltmeter, but certain obstacles, the principal one of which was the lack of an insulating material of sufficient dieletric strength, have heretofore prevented the development and application of this type of meter.

To overcome the objectionable features of the methods of measurement described above, and at the same time develop an accurate, compact and portable design of electrostatic voltmeter free from the weakness of the ordinary form, the design shown in Fig. 1 and described below was proposed and has been worked out very satisfactorily.

Condensers grouped in series divide the total impressed pressure among themselves inversely as their respective capacities, and this method has been made use of in this system; the measuring elements consisting of a series of arrangements of fixed and movable condensers, the latter being suitably pivoted, provided with a spring control and actuating an indicating pointer arranged to pass over a suitably graduated scale.

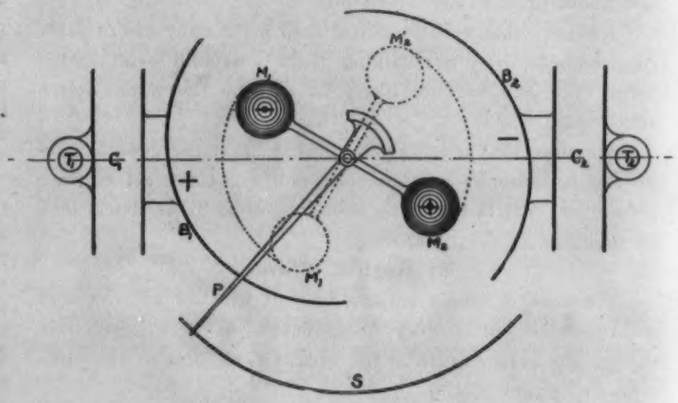

FIG. 2.

The arrangement of the system is shown diagrammatically in Fig. 2, M1—M2, representing the movable condenser element, consisting of two hollow spherical end cylinders, B1—B2, representing two fixed condenser elements connected to the nearest plate of C1—C2, the outer plates of which condenser section are connected to the terminal posts—T1—T2.

The movable system is plainly shown in Fig. 3, and is mounted on highly polished hardened pivots suspended in jeweled bearings. All the parts, as will be seen from Fig. 4, are attached to top plates, which also serves as a support for the terminals and scale chamber. The enclosing case for the condenser element is lined with a metallic oil tight chamber filled with special insulating oil, this immersing the entire measuring element.

With the terminals connected across circuit, the electrostatic charges on the fixed condenser sections induce charges of attraction on the sections M1—M2, which, being movable, tend to deflect in a positive direction and shorten the gap between the moving and fixed parts, B1—B2. This angular deflection is opposed by the controlling springs, and the moving element thus takes up a position of equilibrium between the actuating and restraining forces, thus affording, by means of a pointer P and fixed scale S, a ready means of measuring the potential value producing the deflection.

The danger of static leakage has been eliminated by deeply corrugating the various insulated supports and terminals, thus presenting long leakage surfaces which prevent discharges leaking across. The connection terminals outside of case have been so arranged that the points of con-

nection to line are widely separated, eliminating danger of arcing across. To render the meters free from disturbances of

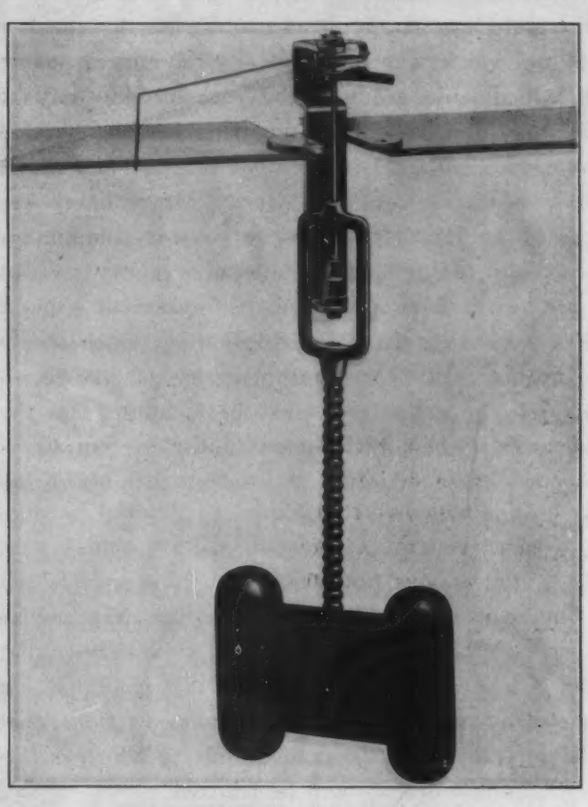

FIG. 3.

external static fields, the use of a metallic shield lining the case and surrounding the measuring element was resorted to, and has proven very effective.

One of the most important features of the design is the employment of oil immersion, thus surrounding and insulating the active elements with a medium of greater dielectric strength than air. By the use of oil, the distances between

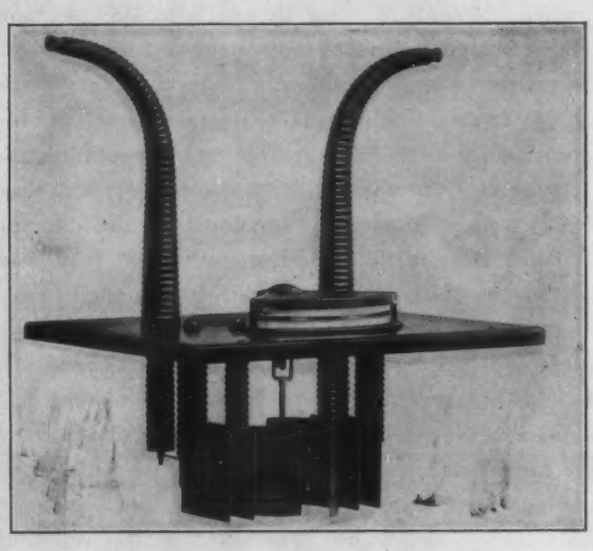

FIG. 4.

the active elements have been greatly reduced, thus securing a high torque, insuring greater, accurate and positive deflection. The use of oil also tends to buoy up the movable system (reducing pressure on the bearings), practically eliminates friction and renders the indications highly dead-beat.

The highly dead-beat indications enable readings to be quickly taken on rapidly, fluctuating pressures, an impossibility with electro-static meters of the usual type.

The scales are 8½ inches in length, and are very satisfactory as to length, legibility and distribution. Owing to the "horizontal edgwise" construction, readings can be taken at a safe distance from the meter, thus avoiding any possibility or danger of shock to operator.

The meter is direct-reading, and free from errors, due to variations in wave form, frequency, external static fields, etc. By manipulating the adjustable condenser sections C1-C2, which have hinged supports, the full scale value of the meter can be changed, thus giving the very distinct advantage of a triple-scale meter and enabling the measuring of widely different potential values. In fact, meters constructed like those shown in the illustrations are suitable for use of measuring up to 25,000 volts, 50,000 or 100,0000 volts, depending upon position of the adjustable condenser sections. When desired, meters of this type can readily be built to measure potentials as high as 200,000 volts.

The construction employed insures a high initial accuracy (within two per cent plus or minus in working range of scale) and their construction is such that the accuracy may be depended upon for long periods of service.

In comparison with the spark gap, ratio methods by use of step-up or step-down transformers, voltmeters in shunt with a part of transformer winding, voltmeter resistance method, etc., the electro-static voltmeter method offers a much more practical, convenient and accurate method under laboratory or commercial conditions.

The advantages secured by the particular design described above over those previously employed, may be summarized as follows:

(1) The distance between the operating elements has been lessened, thereby reducing the size of the instrument.

(2) The actuating forces have been greatly increased, due to the smaller distance between active parts and to the increased specific inductive capacity of oil over air.

(3) A better form and distribution of scale is secured by the reduction of distance between the working parts of the meter.

(4) Employment of oil acting as a dampening medium and making the indications dead-beat and easily read.

Bakersfield.—Articles of incorporation have been filed with the county clerk by the Kern Refining Co., a corporation formed by local men for the purpose of manufacturing asphaltum in the Sunset field. The site of the refinery will be on the Adaline Oil Co.'s land at Sunset, and it is expected that the plant will be built early this fall. E. B. Campbell is at the head of the project, and will probably be manager of the concern. The capital stock of the corporation is $50,000, and $17,500 has been subscribed, as follows: E. B. Campbell, $2000; S. L. Mack, $2000; G. J. Planz, $2000; Joseph Redlick, $2000; J. W. Crosland, $2000; W. H. Hill, $2000; C. A. Barlow, $2000; C. L. Claflin, $2000; Edward Rosenstadt, $1000; S. G. O. King, $500. The directors of the company are S. L. Mack, G. J. Planz, Joseph Redlick, W. H. Hill and C. L. Claflin. The new refinery will make the fourth in the Sunset field. At the present time there is a good demand for asphaltum at prices ranging from $14 to $16 per ton.

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VOL. XIX AUGUST 10, 1907 No. 6

EDITORIAL.

Labor Unions, Politics and Thursday's Primary.

Repeated conferences between the Builders' Exchange, the organization which numbers most of the master builders, and the Building Trades Council, which comprises all the unions engaged in building, have as yet proved of no avail in reaching the settlement which was designed to preserve industrial peace for the next three years. The refusal of the Labor Union leaders to enter into a long term contract with the employers will, it is probable, result in improved building conditions. It has been demonstrated plainly enough that the scale of abnormal wages which has obtained in San Francisco for so long could not continue forever. Capital, although realizing that in the reconstruction of San Francisco lay a most promising field for investment, drew in its horns when it was apparent that a building which would cost six hundred thousand dollars in New York or elsewhere would cost a million dollars in San Francisco. Nor as long as the Trade Unions continued in absolute mastery of the industrial situation was there any guaranty against still more extravagant demands.

Only during the last three months has it been demonstrated that it was possible to operate any large industry in San Francisco without complete dependence upon Labor Unions. When the Carmen's Union culminated a succession of strikes by the last walkout, which was based on entirely unreasonable and unjustifiable grounds, the patience not only of the United Railroads but of the general public, became exhausted. In successfully combatting this last strike and in restoring street car service Mr. Calhoun has rendered an inestimable service to this community. The results of the United Railroad's victory are not to be measured alone by the restoration of a great public convenience, the interruption of which sorely handicapped the peace and proserity of the community. The great lesson has been taught that the "Open Shop" is not the impossibility in San Francisco which the majority of residents heretofore believed. The undeniable principle of industrial freedom has been thoroughly vindicated, and we believe that only by the zealous preservation of this principle can the future progress and prosperity of San Francisco be assured. When the outside world understands that labor is free in San Francisco and that capital is not impeded by intolerable demands and restrictions, that great revival of industry and commerce which is this city's manifest destiny will be realized.

It is important that San Francisco should be as free from class domination politically as industrially. We are on the eve of a municipal campaign. The administration of civic affairs by representatives of the Union Labor party came to a shameful close only a few weeks ago. It should be many years before San Francisco is ready to bow her neck to such a yoke again. And yet unless every honest and independent citizen arouses himself promptly to his civic duty there is grave danger that this fatal mistake may be repeated, and we will find next January the administration once more in the hands of the party which has proved itself so shamefully incompetent and corrupt in office. Despite the sound counsel of at least one labor leader, the Unions, instead of hiding their heads in humiliation at the colossal failure of their representatives in public office and retiring from the political field, are straining every nerve to retain their domination of public affairs. It is said that a very large campaign fund, raised from the funds contributed by sympathetic Unions to the strikers, is in the hands of Mr. P. H. McCarthy, president of the Building Trades Council, and is being used for political purposes. If such is being done, the Union men who are making sacrifices each week in the belief that they are contributing to the relief of the strikers, should

discover how their contributions are being misdirected. Mr. Walter Macarthur, president of the Sailors' Union, and editor of the Seaman's Journal, a man who by his honesty and straightforwardness of purpose has commended himself even to those who have small sympathy with misdirected Trade Unionism, has been frank enough to declare that he realizes the fatal mistake made by the Unions in entering the political arena, and he has washed his hands of Labor Union politics. If the political reign of Labor Unionism in San Francisco is to be upset, such desirable result will be attained largely by the influence of such clear-headed and honest labor leaders as MacArthur.

Next Tuesday's primaries will be of great importance, and it behooves every good citizen to play his part of civic duty by marching in the ranks of good government. The total primary registration of sixty thousand electors shows an increase of ten thousand over the whole registration in 1906. A large primary poll should mean a large independent vote. The danger of a repetition of surrendering municipal affairs to Labor Unionism is so great that every independent citizen should arouse himself.

CIVIL SERVICE EXAMINATION.

The United States Civil Service Commission announces an examination on September 4, 1907, to secure eligibles from which to make certification to fill a vacancy in the position of engineer, Cheyenne River Agency, South Dakota (Indian Service), at $720 per annum, and similar vacancies as they may occur.

The examination will consist of the subjects mentioned below, weighted as indicated:

Subjects.	Weights.
1. Practical questions (covering installation, repair, and operation of boilers and steam engines and pumps	60
2. Experience in handling steam engines and boilers and pumps (rated on application)	40
Total	100

Applicants should at once apply to the United States Civil Service Commission, Washington, D. C., for application Form 1093.

The United States Civil Service Commission announces an examination on September 4th and 5th, 1907, to secure eligibles from which to make certification to fill several existing vacancies in the position of hydrographic surveyor, at salaries ranging from $1,200 to $2,200 per annum, in the Navy Department, and similar vacanies as they may occur.

The specific positions to be filled are in connection with the work of surveying Almirante Bay and other surveying work on the south coast of Cuba, which work, the Department states, will last from one to two years or longer.

The examination will consist of the subjects mentioned below, weighted as indicated:

Subjects.	Weights.
1. Mathematics (covering algebra to quadratics, elements of plane and solid geometry, and trignometry) and computations	15
2. Drawing and plotting	20
3. Surveying instruments (construction, use, and care)	15
4. Surveying (general and special questions)	25
5. Training and experience	25
Total	100

Applicants should at once apply to the United States Civil Service Commission, Washington, D. C., for application Form 1312.

The United States Civil Service Commission announces an examination on September 11th and 12th, 1907, to secure eligibles from which to make certification to fill two vacancies in the position of piecework computer, Nautical Almanac Office, Navy Department, and similar vacancies as they may occur in that office. The Department states that piecework computers are paid according to the kind and quantity of work performed and that beginners earn from $700 to $900 per annum. Promotions are made from this grade without further examination to the grade of assistant, as vacancies occur. The salaries of assistants range from $1,000 to $1,600 per annum. The examination will consist of the subjects mentioned below, weighted as indicated:

Subjects.	Weights.
1. Pure mathemathics, including geometry (plane and solid), algebra, trigonometry (plane and spherical), and calculus, all as covered in the higher class of text-books	30
2. General and spherical astronomy, elementary questions	20
3. Practical computations, involving mathematical and astronomical knowledge, as called for under the subjects of pure mathematics and spherical astronomy, but especially designed to test the competitor's ability to use tables of logarithms quickly and correctly.	50
Total	100

Time allowed, two days of six hours each. The first two subjects will be given on the first day and the third subject on the second day.

PERSONAL.

C. L. Cory has removed his offices to Union Trust Building, San Francisco.

J. E. Way, of R. Thomas & Sons Co., East Liverpool, Ohio, was in San Francisco during the past week.

E. M. Scribner, president of the California Electrical Works, is on a short business trip to Portland and Seattle.

William Giddes has been appointed superintendent of shops of the Portland Railway, Light & Power Company.

Edgar C. Bradley has been elected vice-president and general manager of the Pacific Telephone & Telegraph Company.

TRADE CATALOGUE.

"Storage Batteries for Stationary Service" is the title of a handsomely prepared bulletin issued by the Westinghouse Machine Co., Pittsburg, Pa. The "Type S" storage battery positive and negative plates are made of purest lead without tin, antimony, or other alloy, with the active material formed from the lead by a Plants' process, with sulphuric acid as an electrotype. This battery embodies the result of years of intelligent study. It possesses exceedingly long life maximum efficiency and absolute freedom from injurious sulphation.

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Furnished by Courtesy San Francisco Stock and Bond Exchange.

Outstanding	INTEREST	MISCELLANEOUS BONDS.	AUGUST 2		AUGUST 3		AUGUST 5		AUGUST 6		AUGUST 7		AUGUST 8	
			Bid	Asked	Bid	Asked	Bid	Asked	Bid	Asked	Bid	Asked	Bid	Asked
1,532,000	F & A	Associated Oil Co. 5%	.....	81	....	81	.....	81	.....	81	.....	80	.....	80
2,250,000	M & S	Bay Counties Power Co. 5%	.....	98	94	.....	.....	96	94½	96	94½	96	.....	95½
1,000,000	F & A	Cal. Central Gas & El. 5%	.....	.....	.....	.....	.....	.....	90	100	.....	100	.....	97½
9,600,000	M & S	Cal. Gas & El. Gen. M. & C. T. 5%	79½	80	79½	80¼	79¾	.....	79¾	80¼	79½	80¼	79½	80¾
900,000	J & J	California St. Cable Co. 5%	98	101	98	101	98	101	98	101	98	101	98	101
2,000,000	J & J	Contra Costa Water Co. 5%	100	100½	.....	100½	.....	100½	.....	100½	.....	100½	.....	100½
1,000,000	J & J	do do Gen. Mtg. 5%	.....	96	.....	96	.....	96	.....	96½	.....	96½	.....	96
623,000	F M A N	Edison Light & Power 6%	.....	.....	.....	.....	.....	.....	.....	.....	105	.....	105	.....
650,000	M & S	Ferries & Cliff Ho. Ry. 6%	103	.....	103	.....	103	.....	103	.....	103	.....	103½	.....
671,000	A & O	Geary St. Ry. 5%	52	.....	52	.....	52	.....	52	.....	52	.....	52	.....
610,000	M & N	Honolulu R. T. & L. Co. 6%	105½	.....	105½	.....	105½	.....	105½	.....	105½	.....	105½	.....
300,000	A & O	Lake Tahoe Ry. & T. Co. 5%	.....	102½	.....	102½	.....	102½	.....	102½	.....	102½	.....	102½
500,000	J & J	Los Angeles Elec. Co 5%	.....	100	.....	100	.....	100	.....	100	.....	100	.....	100
1,300,000	J & J	Los Angeles Gas & Elec. Co. 5%	.....	100	.....	100	.....	100	.....	100	.....	100	.....	100
5,000,000	A & O	Los Angeles Ry. 5%	109	.....	109	.....	109	.....	109	.....	109	.....	109	.....
1,000,000	A & O	Los Angele Lighting Gd. 5%	.....	103	.....	103	.....	103	.....	103	.....	103	.....	103
1,500,000	A & O	Los Angeles Pac. R. R., 1st Con. Mtg. 5%	102¾	.....	102¾	.....	102¾	.....	102¾	.....	102¾	.....	102¾	.....
3,030,000	M & S	L. A. Pac. R. R. of Cal. 5%	.....	101	.....	101	.....	101	.....	101	.....	101	.....	101
3,000,000	J & J	Market Street Cab e 6%	108	.....	108	.....	108	.....	108	.....	108	.....	108	.....
5,141,000	M & S	do Ry., 1st Cons. Mtg. 5%	103	107	103	107	103	107	103	107	.....	107	.....	106
100,000	A & O	Mill Valley & Mt Tamalpais S.Ry. 5%	103	.....	103	.....	103	.....	103	.....	103	.....	103	.....
4,751,000	A & O	Northern Ry Co. of (Cal.) 5%	112	.....	112	.....	112	.....	112	.....	112	.....	112	.....
1,498,000	J & J	North Pacific Coast R. R. 5%	100¾	.....	100¾	.....	100¾	.....	100¾	.....	100¾	.....	100¾	.....
1,074,000	J & D	Northern Cal. Railway 5%	102½	.....	102½	.....	102½	.....	102½	.....	102½	.....	103½	.....
980,000	J & D	Northern Cal. Power Co. 5%	95	100	95	100	97¼	97¾	97¼	97¾	.....	99	.....	100
6,000,000	A & O	Northern Electric Co. 5%	.....	97½	.....	97½	.....	97½	.....	97½	.....	97½	.....	97½
1,000,000	M & S	Oakland Gas Light and H. 5%	104	106	104	.....	104	.....	104	106	104	.....	104	.....
1,374,000	J & J	Oakland Transit Co. 6%	109	.....	110	.....	110½	.....	110½	.....	110½	.....	110¼	.....
1,600,000	J & J	Oakland Transit 5%	102½	.....	102½	.....	102½	.....	102½	.....	102½	.....	102½	.....
1,326,000	J & J	Oakland Transit Con. 5%	102	102½	102	.....	102	102½	102	102½	102	.....	101½	102½
7,000,000	J & J	Oakland Traction Con. 5%	98½	99½	.....	99¼	99	99¼	99	99½	.....	99½	.....	99½
1,500,000	J & J	Oakland Water Co. gtd. 5%	.....	98	.....	98	.....	98	.....	98	.....	98	.....	99½
2,000,000	A & O	Omnibus Cable Ry. 6%	108½	112	108½	112	108½	112	108½	112	108½	112	108½	112
1,149,000	S D M J	Pacific Gas Imp. 4%	.....	92½	.....	92½	.....	92½	.....	92½	.....	92½	.....	92½
8,494,000	J & J	Pacific Electric Ry. Co. 5%	103½	104¼	103½	104¼	104	.....	104	.....	103¾	.....	103¾	104¼
4,491,000	J & J	Pacific Light & Power Co. 5%	.....	100¼	.....	100¼	.....	100¼	.....	100¼	.....	100¼	.....	100¼
3,000,000	J & J	Pacific Tel. & Tel. Co. 5%	.....	103	.....	103	.....	103	.....	103	.....	103	.....	103
350,000	J & J	Park & Cliff House Ry. 6%	.....	103½	.....	103½	.....	103½	.....	103½	.....	103½	.....	104
250,000	J & J	Park & Ocean R. R. 6%	102	.....	102	.....	102	.....	102	.....	102	.....	102	.....
700,000	M & S	Powell Street Railway 6%	.....	107½	.....	107½	.....	107½	.....	107½	.....	107½	.....	107½
2,500,000	M & N	Sacramento Elec. Gas & Ry. 5%	.....	101¼	.....	101¼	.....	101	.....	100½	.....	101	99	101
6,000,000	A & O	S. P. & S. J. Valley Ry. 5%	113	.....	113	.....	113	.....	113	.....	113	.....	113	.....
3,000,000	J & J	S. P., Oak. & San Jose Ry. 5%	.....	104	.....	103¾	.....	104	.....	104	.....	104	.....	104
1,500,000	J & J	do do 2d Mtg. 5%	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1,500,000	A & O	S. J. & S. Clara Co. R. R. 4½%	.....	95	.....	95	.....	95	.....	95	.....	95	.....	95
642,000	A & O	Sierra Ry. of Cal. 6%	.....	107½	.....	107½	.....	107½	.....	107½	.....	107½	104¾	.....
6,000,000	J & J	S. P. R. R. of Arizona 6% (1909)	100¾	.....	.....	.....	101	.....	100¾	.....	101	.....	101	.....
4,000,000	J & J	do do do (1910)	101¾	.....	101¾	.....	101¾	.....	101¾	.....	101½	101¾	101½	.....
5,116,000	A & O	S. P. R. R. of Cal. 6% (1912)	108	.....	108	.....	108	.....	107	108½	107½	.....	107¾	.....
4,127,500	M & N	S. P. R. R. of. Cal., 1st c. gtd. 5%	114	117	114	117	114	117	114	117	114	.....	114	.....
3,533,000	A & O	S. P. Branch Ry. of Cal., 6%	123½	.....	124½	128	124½	.....	124½	.....	124½	.....	123½	126½
81,178,000	J & J	S. P. R. R. Co., 1st Ref'd'g. 4%	91	91¾	91	91¾	91	91¾	90⅞	.....	90¾	91¼	90¾	91½
17,500,000	J & D	Spring Valley Water Co. Gen. Mtg. 4%	83	.....	83	.....	83	.....	83	.....	83	.....	83	.....
300,000	M & S	Stockton Gas & Elec. Co. 6%	100	.....	100	.....	100	.....	100	.....	100	.....	100	.....
2,000,000	J & J	United Gas & Elec. Co. 5%	.....	101	.....	101	.....	101	.....	101	.....	101	.....	100
20,000,000	A & O	United R. R. of S. F. 4%	71	71½	71¼	71½	71⅛	.....	70½	71	70½	71	70	71
2,500,000	M & N	Valleys Counties Power Co. 5%	.....	100	.....	100	.....	100	.....	100	.....	100	.....	100
		Water Stocks.												
		Contra Costa	.....	62	.....	62	.....	62	.....	62	.....	62	.....	62
6,000	Quarterly	Marin County	.....	62	.....	62	.....	62	.....	62	.....	62	.....	62
280,000	.....	Spring Valley Water Co.	20	...	20	20⅛	20	20⅛	20	20⅛	20	20⅛	20	20¼
		Gas and Electric Stocks.												
37,500	.....	Martel Power Co.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
9,340	.....	Mutual Electric Light Co. (Ctfs.)	4½	.....	4½	.....	4½	.....	4½	.....	4½	.....	4½	.....
37,336	.....	do (Extended Ctfs.)	12¾	13	12⅝	12⅞	12¾	.....	12¾	.....	12¾	.....	12⅜	.....
40,000	Monthly	Pacific Lighting Co.	65	.....	65	.....	65	.....	65	.....	.....	67¾	.....	67½
12,000	.....	Stockton Gas & Elec. Co.	52	.....	52	.....	52	.....	52	.....	52	.....	52	.....
		Street Railroad Stocks.												
10,000	.....	California	.....	140	.....	140	.....	140	.....	140	.....	140	.....	140
10,000	.....	Geary	.....	41	.....	41	.....	41	.....	41	.....	41	.....	41
10,000	.....	Presidio	.....	25	.....	25	.....	25	.....	25	.....	25	.....	25
	Semi-an.	Associated Oil Co.	30½	31	30	31	30½	.....	30	.....	0	.....	29½	30¼
1,625	Quarterly	Mill Valley & Mt. Tamalpais S. Ry.	.....	110	.....	110	.....	110	.....	110	.....	110	.....	110
180,000	Quarterly	Pac. Tel. & Tel. Co. (Pfd.)	.....	95	.....	95	.....	95	.....	95	.....	95	.....	95
180,000	.....	Pac. Tel. & Tel. Co. (Common)	7½	15	7½	15	7½	15	7½	15	7½	15	10	15

Unlisted Securities

750,000	A & O	Bay Counties Power Co. 6%	.....	103½	.....	103½	.....	98	.....	95½	.....	95	.....	95
745,000	M & S	Blue Lakes Water Co. 6%	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
2,000,000	A & O	California Northwestern Ry. 5%	.....	108	.....	108	.....	108	.....	108	.....	108	.....	108
160,000	J A J O	Marin County Water 5%	.....	100	.....	100	.....	100	.....	100	.....	100	.....	100
600,000	J & J	Risdon Iron Works 5%	.....	100	.....	100	.....	100	.....	100	.....	100	.....	100
500,000	M & S	S. F. Dry Dock 5%	.....	109	.....	109	.....	109	.....	109	.....	109	.....	109
8,000,000	M & N	S. P. Gas & Electric 4½%	.....	93	.....	95	.....	93	.....	95	.....	95	.....	95
3,926,000	J & J	S. P. & North Pacific Ry. 5%	104	.....	104	.....	104	.....	104	.....	104	.....	104	.....
5,500,000	J & J	South Pacific Coast Ry. 4%	.....	95	.....	95	.....	95	.....	95	.....	95	.....	95
.....	.....	Standard Electric Co. 5%	.....	92½	.....	.....	.....	.....	.....	85	.....	85	.....	85
.....	.....	do do Gtd. 5%	.....	87½	75	85	80	84¾	.....	85	.....	85	.....	85
750,000	J & J	Sunset Tel. & Tel. Co. 6%	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
2,250,000	A & O	Sunset Tel. & Tel. Co. 5%	.....	103½	.....	103½	.....	103½	.....	103½	.....	103½	.....	103½
1,000,000	M & N	Sutter Street Railway 5%	.....	105	.....	105	.....	105	.....	105	.....	105	.....	105
		Stocks.												
50,000	Monthly	Gas Consumers' Association	.....	.....	.....	.....	.....	20	.....	20	.....	20	.....	20
100,000	Monthly	Northern Cal. Power Co.	24	25	24	25	24¼	25	24	25	24	25	24	25
.....	.....	Pac. Gas & Elec. (Pfd.)	37½	.....	37½	.....	38	45	37½	.....	37½	39	37	.....
.....	.....	Santa Cruz Port. Cement	.....	55	.....	55	.....	55	.....	55	.....	55	.....	55
.....	.....	Standard Port. Cement (New)	.....	55	.....	55	.....	55	.....	55	.....	55	.....	55
50,000	Monthly	Truckee Electric Co.	.....	.....	15	15½	15	.....	15	15½	15	15½	15	.....

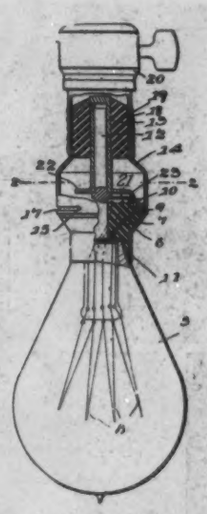
PATENTS

Electric, Gas and Water.

Specially reported for the Journal of Electricity, Power and Gas.

SECTIONAL INCANDESCENT LAMP. 860,627. Geo. E. Bill and Albert D. Redman, Sr., Harrisburg, Pa. Filed January 30, 1906. Serial No. 298,659.

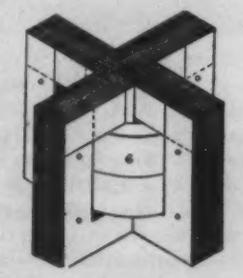
2. A lamp having a plurality of filaments, stationary contacts connected to the filaments, movable contact members



adapted to successively engage the stationary contacts for closing the circuit through any one of the filaments, and means for locking the movable contacts in circuit closing position.

TRANSFORMER-CORE. 861,029. Walter A. Hall, Lynn, Mass., assignor to General Electric Company, a corporation of New York. Filed September 24, 1904. Serial No. 225,736.

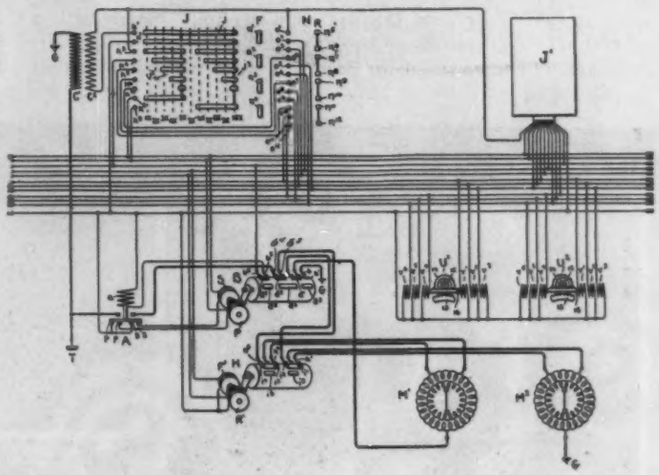
1. A transformer core composed of separate branches



whose meeting edges have longitudinal ribs which intermesh to form a substantially solid leg, the rib on each branch being symmetrically disposed with respect to the central plane of said branch.

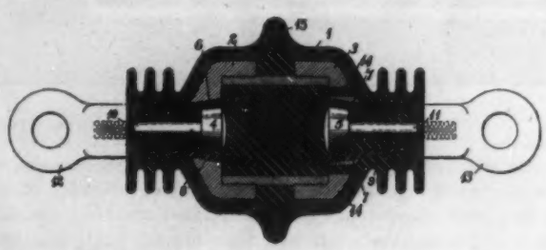
CONTROLLING ALTERNATING-CURRENT MOTORS. 860,998. Charles P. Steinmetz, Schenectady, N. Y., assignor to General Electric Company, a corporation of New York. Filed January 25, 1904. Serial No. 190,437.

8. In combination, a plurality of repulsion motors, a series-parallel switch, brush-shifting devices, a control system for said switch and said devices, and a master-controller



for said system arranged when in its first position to place said switch in its series position and to displace the brushes of the motors their maximum distance from running position, then by its movement to shift said brushes to running position, then to displace said brushes and place said switch in its parallel position, and then to shift said brushes to running position.

STRAIN-INSUALTOR FOR ELECTRIC LINES. 861,149. Theodore Varney, Pittsburg, Pa., assignors to Westinghouse Electric & Manufacturing Company, a corporation of Pennsylvania. Filed June 4, 1906. Serial No. 320,139.



1. A strain insulator comprising a metal tube, removable end caps therefor having taper holes, taper plugs seated in said holes and having stems or bolts projecting outwardly therefrom, and means for insulating the taper plugs from the end caps.

INDUSTRIAL

ELECTRIC HEATING AND COOKING.

The popular demand for electric cooking and heating has reached the point where it becomes necessary to have separate "heating circuits" for the satisfactory installation of the apparatus. The advantage of a separate heating circuit over an increase in current-carrying capacity of the lighting circuits is that it permits the use of a separate meter with a special rate for heating or cooking service. The heating circuits are, of course, used for power as well, supplying current for the numerous motors useful about a modern residence, such as sewing-machine motors, buffing and polishing motors, grinding and sharpening machines, fans, washing machines, churns, refrigerators, compressed-air motors for house-cleaning, coffee grinders, meat grinders, massage motors, etc. So many progressive lighting companies have encouraged the use of electric cooking apparatus by the adoption of a two-rate schedule of prices, making special inducements to their customers to install such apparatus, that the time is not far distant when the universal system will be to encourage the day load by low heating and power rates in residences as well as in shops and factories. Few houses are at present built without wiring for electric lights, in many cases where the electric service is not at present available, but where extension of the mains is expected in the sometime remote future. The value of this policy has come to be undisputed by builders and owners, and it remains for the progressive architect and electrical contractor to take a similar step towards the extension of the uses of electricity by including in their designs for new buildings special provision for the future introduction of cooking and heating apparatus.

The energetic investigation of all methods for increasing the output of the central station, as signified at present by marked activity in the discussion of the subject by all assemblies of central station men, leaves no doubt of the rapid growth of this service. Those architects who keep themselves in the front rank by considering no house up to date in the fullest sense that is not provided with opportunities for electric heating and cooking will gain the benefits of their advanced ideas. The additional initial cost, while it means just so much more business to the electrical contractor, is of trifling moment to the owner, and the electric power bills are insignificant compared to the advantages gained. In the residence shown on pages 5, 6, and 18 all lighting, cooking, and heating, except winter furnace heating, is done by electricity. The family consisted of five persons, and at five cents per kilowatt hour for heat and power, the average total of

RESIDENCE WITHOUT A KITCHEN CHIMNEY

twenty-four monthly bills, exclusive of lighting bills, was $6.69.

The great desirability of heating and cooking without coal, gas, or oil, smoke, flame, or soot, encouraged enthusiastic inventors to attempt the development of thoroughly practicable electric appliances for everyday use. The experimental stage has now been passed and the devices described on the following pages mark a new epoch, in that they combine the unsurpassed convenience of electricity with reliability and, when properly used, with excellent economy.

Serviceability has been a **sine qua non** in the design of General Electric heating appliances, and they may be expected to withstand about the same treatment as ordinary household utensils. They will not "burn out" when the current is thoughtlessly left "on," although such practice is, of

ELECTRIC KITCHEN

course, not recommended. The dishes are made without solder and the heating unit has remarkably long life.

The line of electric appliances manufactured by the General Electric Company contains devices for practically all kinds of heating and cooking in the household, but new styles of finish and individual types of apparatus are added from time to time to meet special requirements. All the General Electric heating and cooking devices have a harmony of design which adds greatly to the appearance of an outfit, whether for dining room, bath room, kitchen, or other use. They are also suitable for cafes, barber shops, hospitals, dentists' and physicians' offices, and for various manufacturing processes. Each utensil has been developed to accomplish its particular purpose with the greatest facility and economy.

Electric heating and cooking devices are portable, readily attached to the circuit and turn on or off with a switch like an incandescent lamp. Many of them have already been classed as "indespensable" simply because of their convenience, and ideal housekeeping is made possible for all. There is no **waste heat,** as they are designed to generate a high temperature where it is wanted and to minimize useless radiation. Electric cooking and ironing will not appreciably increase the room temperature on the warmest summer day.

The apparatus used in electric heating and cooking is naturally divided into two classes: those devices which may be operated on ordinary lighting circuits and those for which separate circuits are desirable. Roughly speaking, the utensils which do not take more than 500 watts are considered as lighting circuit devices, those exceeding this consumption of power being classed as heating circuit devices. The first group includes percolators, chafing dishes, small flatirons, liquid heaters and stoves, heating pads, etc. Ovens, large irons, stoves and grids, radiators, etc., are heating circuit devices.

Two distinct forms of heating elements are used in the General Electric Company's cooking and heating apparatus, viz.: the "Cartridge Unit" and the "Quartz Enamel Unit." With the exception of air heaters, luminous radiators and a few special devices, one or the other of these types, according to the service required, is found in all the appliances.

The Cartridge Unit consists of thin tape of special resistance metal about ⅛ inch wide wound edgewise into a small hollow cylinder. After winding, the coil is dipped in an insulating cement and fired while the ends are pressed together, making a solid, well-insulated, and sturdy construc-

COOKING AND BAKING OUTFIT NO. 2

tion. The edgewise wound coil is then inserted in a mica-lined brass tube capped with a cement plug, through which the leading-in wires are brought. Great care is taken in the design that the proper radiation is secured, to prevent the heat of the coil ever reaching destructive temperatures, so that the cartridge or apparatus containing it may be left in circuit indefinitely without fear of a burn-out.

Quartz Enamel Units use round resistance wire wound in a coil of small diameter. After these coils are measured for resistance and cut to the correct length, they are wound into a flat spiral. Pure mica strips insulate between the convolutions of this spiral, but no insulation except air is used between turns, as the wire is under sufficient strain to slightly separate them. The disc made in this way is held against a layer of quartz grains imbedded in enamel directly on the bottom of a heater. The combination of quartz and enamel gives a practically infusible, indestructible, highly-insulating and yet heat-conducting frame to the element.

Both types of heating elements are readily replaced if damaged by accidents. The cartridge unit is employed in flatirons, ovens, etc., while the liquid heaters, chafing dishes, frying pans, etc., are equipped with the quartz-enamel form.

ALLIS-CHALMERS INDUCTION MOTORS BELTED TO PAINT GRINDING MACHINERY VERSUS MOTORS DIRECT CONNECTED.

The paint grinding machinery of a certain large Western manufacturer of pigments, the Wadsworth-Howland Company of Chicago, has for some months past been operated by means of forty-odd Allis-Chalmers 3 phase, 60 cycle, 220 volt, belted induction motors, ranging from 1 horse power to 30 horse power, all of which are suspended from the ceiling.

The motors are at present operated by power purchased from the local lighting company, although a 100 kilowatt engine driven alternator is available for use if necessary. In order to ascertain the exact difference in power consumption between belted and geared motors, and the relative effciencies of the two methods, a test was made on one of the paint grinders, and the power actually consumed was accurately measured, using first a belted Allis-Chalmers motor, and second a geared motor of another design.

The mill on which the tests were made is used for grinding yellow ochre, after it has passed through a mixer. The machine consists of two pairs of mill stones about 30 inches in diameter, each mounted with axis vertical. The lower stones of each pair revolve while the upper stones are fixed. One pair of stones is located in front of, and below the other, so that the paint discharged from the upper pair will drop into the hopper of the lower. The fixed stones are fastened to the frame of the mill while the lower revolving stones are carried on the ends of vertical shafts connected together by spur gearing and driven from the main shaft by a bevel gear and pinion. The main shaft runs at a speed of approximately 132-136 revolutions per minute, and with the present belted outfit is provided with tight and loose belt pulleys. The mill is driven from a small countershaft located directly above the main shaft, the motor being suspended from the ceiling and located about 10 feet from the countershaft.

Paint mixed with linseed oil is fed, from a mixer, into the upper pair of stones, and after passing through them is discharged into the lower pair. The process is continuous, and when the mill is first started, it requires considerably more power than after an hour or so, when the stones have become heated and the paint more easy flowing. The power required also depends on the rate of feed, and the setting of the stones; if the stones are too tightly adjusted, the power required is very much increased. In these tests every precaution was taken to have adjustment of the stones, and the rate of feed the same in each case. The wheels for adjusting the stones were marked so that they could be brought to exactly the same position in each test.

Test on Belted Motor.

Each of these grinders is provided with an individual 10-horsepower belted motor running at approximately 1130 revolutions per minute at full load, and equipped with a type "A" potential starter. The following tests were made: First, motor running idle with belt off; second, motor running belting and countershaft, mill belt on loose pulley; third, motor running mill and grinding paint.

In tests one and two, readings of volts, amperes and watts were taken, Weston instruments being used for measuring volts and watts. Current was measured by a Thompson ammeter, which had a range of only 15 amperes, and hence was not available for load readings. In test three, indicating wattmeter readings were taken at the beginning and end of the test, and in addition a Fort Wayne polyphase recording watt-hour meter, installed by the lighting company, was placed in circuit to record the total watt-hours during the run. A four-hour run was made, the mill being cold when started. Allis-Chalmers motor, 10 horsepower; 220-volt; 26 amperes; 3-phase; 60 cycle; 1130 revolutions per minute.

Summary.

	Belted	Geared
Watts (motor running idle)	600	400
Watts (motor running belt and countershaft)	900	...
Watts, motor running mill (beginning to run)	10,300	12,300
Watts, motor running mill (end of run)	7,200	8,500
Kilowatt hours for 4 hours' run (from recording wattmeter)	26	28.5
Total weight of paint ground, pounds	86.75	73.5
Average power factor	90	80

From the wattmeter readings given, and also from the recorded power consumption for the four-hour run, it is plain that the geared slow speed motor, instead of saving power, actually requires about 10 per cent more power than the belt drive. On a longer run, the showing of the geared motor might be improved somewhat because the overload period, during which this motor has a low efficiency, would then be a smaller part of the total. It will be noted that the amount of paint ground with the geared motor was less than with the belted showing that the greater power consumption was not due to any increase in the amount of paint fed into the mill.

The geared motor must necessarily be run at slower speed belted, and a slow speed 50 cycle motor of small output is inferior in electrical performance to a higher speer belted machine. Its no-load losses may be less than for the belted motor as in the present test, but its efficiency at or near full load will be lower.

The lower power factor of the slow speed motor is not a great objection where power is supplied from a large system, since power is measured by watt-hour meters. If, however, the motors were at any time operated from the customer's isolated plant, the lower power factor would be a decided disadvantage, as the current output of the generator is limited.

The amount of paint ground in each case was considerably lower than would have been obtained under average conditions, because the mill stores were not in first class condition. This, however, does not affect the value of the tests as concerns relative power consumption, because the condition of the mill was the same in each case. Also, the recording wattmeter readings were low compared with those of the indicating instrument which was carefully checked before the test and found to be accurate within one per cent. The same instruments were, however, used in each test, the primary object of which was to obtain comparative data.

The Westinghouse Electric & Manufacturing Company, of East Pittsburg, has received through G. & O. Braniff & Company, agents for the former company in Mexico, an order for one of the electrical equipments of the Vera Cruz tramways, built by the Vera Cruz Light, Power & Tramway Company. Vera Cruz is the second city in Mexico to be electrified.

The Chase-Shawmut Company, of Newburyport, Mass., has recently placed upon the market a newly-approved Stage Pocket, reconstructed to comply with new rules by the Board of Fire Underwriters, which require pockets to be fused on switchboard. In placing this article upon the market the Chase-Shawmut Company has taken into careful consideration the rough usage received by articles of this nature in street railways, park theatres, etc., and sincerely believe that this simple, safe and durable pocket will fulfill all requirements.

NEWS NOTES

TRANSPORTATION.

Los Angeles, Cal.—Work has begun on clearing the land by the Los Angeles-Pacific Railway, preparatory to commencement of work on the subway, which will traverse the land in a diagonal direction from the south side of Temple Street and Hill northwest towards Hollywood.

San Bernardino, Cal.—The Pacific Electric Railway Co. is rushing the completion of its system between Covina and Pomona, and it is said that plans call for the continuance of the line via Rialto to San Bernardino.

Los Angeles, Cal.—Sol. Davis, of the Golden State Realty Co., states that the Los Angeles-Pacific will build a standard gauge line to Sherman and equip it with the Mahoney third rail system, to test the invention.

Los Angeles, Cal.—Two million feet of oak lumber in logs, the first cargo of that kind of timber ever brought across the Pacific, reached San Pedro Monday on the ship "Skogstad." The vessel was loaded at Mororan, Japan, and is under charter to the China Import and Export Lumber Co., of Shanghai. From the logs will be made 72,000 ties for Huntington's new electric lines. Construction work already under way will be hastened by the shipment. Lack of ties has delayed the completion of extensions and new work on several parts of the Pacific Electric system. The Huntington companies now are forced to depend upon the Orient for the major portion of their ties. W. Edwards, agent for the importing company, declares that this shipment of oak wood is the opening wedge for a business which will mean the importing of 10,000,000 feet of lumber annually. Local agents will build a mill at San Pedro for sawing the oak logs for the market. The company is assured of heavy business here.

San Jose.—The grading for the Peninsular railroad has been finished from Mayfield to its intersection with the old narrow gauge road at Vasona, near Los Gatos. It is expected that the ballasting will be done at once and that rail laying will be commenced within a few weeks. Trains will be run between San Francisco and Los Gatos in one hour and fifteen minutes when the Bay Shore cut-off is opened and the Peninsular road completed. It is understood that work will proceed as promptly as possible on the electric road, which is already built ten miles west of San Jose, with a junction with the Peninsular road. It will use the same right of way as far as Mayfield, and then go across the Stanford University property along the foothills to Redwood City and San Mateo, the right of way having been purchased. The street grading and cement are being put down in the town of Los Altos on the line, and surveys are being completed for the town of Elevada. Congress Springs, which has been purchased by the railroad, will be improved to some degree this year, but not till next season will plans be made for the ultimate development as one of the great California resorts. It is the intention of the railroad to give Congress Springs one hour and a half service from the city.

OIL.

Tacoma, Wash.—City Council set September 10 upon which the people by vote will say whether they want the proposed Green River gravity water supply. The new water system will cost, according to estimate, $2,000,000, and will give Tacoma an abundance of water until it is a city of 500,000 people.

Coalinga, Cal.—The Associated Oil Co., sections 36-20-14, has five rigs running, one of which is a rotary drill. The rotary is down about 1,500 feet, while the deepest of the other four is in the neighborhood of 1,750 feet. The company will start four more wells on the property as soon as the material can be procured and the rigs built. This company is laying a 6-inch pipe line from Station No. 1 tanks to the new tanks that it is having built on section 36-20-14. In all probability the company will make the new station to be built on section 36 its Station No. 1, and use the present Station No. 1 as a collecting station.

Los Angeles, Cal.—Three hundred new oil cars were received here last week by the Southern Pacific for use on the Pacific Coast lines, principally in California. Local officials of the railroad believe this large number of tanks will relieve a shortage that has long been serious to the company, as well as to producers and consumers. The situation had become so critical that the railroad could not carry its petroleum to supply points as fuel for its own locomotives, while private shippers have been placed at even greater disadvantage. The latter look upon the new cars as a boon, and the company expects to save many thousands of dollars a month in freight tolls.

San Francisco, Cal.—California's oil production this year will reach the total of 35,000,000 barrels, an increase of more than 4,000,000 over the production of last year. Every oil field in the State has increased its output except Kern River, but even with a decrease in that district it will produce between 9,000,000 and 10,000,000 barrels. Santa Maria shows the biggest increase of all, and has a total of something like 8,500,000 barrels to its credit. Following is a statement of the comparative production in various fields:

Districts.	Production 1906.	Estimate 1907.	Increase.
Santa Maria	5,400,000	8,500,000	3,100,000
Coalinga	8,500,000	9,500,000	1,000,000
Kern River	11,000,000	9,500,000	.....
McKittrick	500,000	1,000,000	500,000
Sunset	300,000	300,000	.....
Midway	.....	300,000	300,000
Fullerton	1,700,000	2,400,000	500,000
Whittier	650,000	650,000	.....
Los Angeles (city and Salt Lake)..	1,700,000	2,400,000	300,000
Newhall and Ventura	400,000	400,000	.....
Other districts	65,000	70,000	5,000
Totals 30,215,000		35,020,000	5,705,000

TELEPHONES.

Sunnyside, Wash.—The Farmers' Independent Telephone Co. is building a line from this place to Outlook.

Maple Falls, Wash.—The Maple Falls Telephone Co. will soon begin the construction of a line to Glacier and also to Kendall.

Cheney, Wash.—Council has granted Wm. T. Duboise a ten-year franchise to construct a telephone and telegraph system.

Twin Falls, Idaho.—Farmers in this vicinity are organizing a company to build telephone lines from this place to Minidoka, Boise, Pocatello and Salt Lake.

Florence, Ore.—Capt. Martin, of the U. S. Life Saving Service, says a telephone line will be built from the life saving station to Gardiner, and also a line to Florence.

Medford, Ore.—The Medford-Blue Ledge Telephone Co. has been organized and will build a line to Blue Ledge with a branch to the Sterling mine. The distance is about 35 miles.

Seattle.—The U. S. Govt. has let a contract to the U. S. Steel Corporation for transmission towers to be used for wireless telegraph service in Alaska. The towers will be 176 feet high.

Tacoma, Wash.—The Home Telephone Co. is preparing to lay a cable to connect the mainland with Vashon and Maury islands. The main station will be at Burton, on Quartermaster Harbor.

Boise, Idaho.—The Bear Creek Telephone Co. has been granted a permit to construct a telephone line in the Payette national forests, from Marshal Lake mining district to Resort, connecting with the Warren-Meadows telephone service at or near that place, and covering a distance of 12 miles.

Spokane, Wash.—The Interstate Telephone Co. has plans in hand to extend the system into the fruit and farming districts, south and east of Spokane; also to the Coeur d'Alene Indian reservation and the lumber and mining camps on the St. Joe River. The company will establish an air line between Spokane and Wallace, Idaho, country roads being used where practicable. A line will also be built to Bonners Ferry.

TELEPHONE AND TELEGRAPH.

Butte, Mont.—The Montana State Federation of Labor has declared the Rocky Mountain Bell Telephone Co. unfair and has ordered out all of the operators in the State affiliated with the organization. Every trades council in the State will be advised of the action and directed to boycott the company.

Santa Clara, Cal.—Ground has been broken for the erection of a new telephone building on the Fatjo property on Franklin Street. Morrison Bros. have been awarded the contract. The Pacific Telephone Co. will extend and improve the system. New switch boards and lines will be installed and an up-to-date service given.

San Francisco, Cal.—Assistant General Supt. I. N. Miller of the Western Union Telegraph Co. says: "I do not expect a visit from a committee of the unionists, as they know they would not be received by the company. The Western Union is not using any discrimination in taking back its former employes, except in the cases of some who have not satisfactorily answered our questions regarding their conduct during the strike. These were refused employment. The company is carrying out, in good faith, the terms of the agreement arranged through Labor Commissioner Neill. We are re-employing men as we need them. The assignment of the men taken back to the other positions than those they left cannot be called discrimination or a violation of the agreement. Operators have been re-employed by our company faster than the agreement called for, and other men will be taken on as needed."

San Francisco.—Edgar C. Bradley, personal representative of the president of the American Bell Telephone Co., has assumed practical control of the Pacific Telephone & Telegraph Co. and all its holdings. Mr. Bradley has been elected third vice-president and general manager, both positions being specially created for him. According to officials of the company, the change has no significance or connection with recent developments. President Scott still retains his official title, although yielding practical direction of affairs to the new officer. Bradley does not displace any one, but become sa third vice-president, the other two being Louis Glass and E. J. Zimmer. His connection with the American Bell Telephone Co., it was stated last night, has been severed and he will henceforth devote himself solely to the local company. Heretofore E. J. Zimmer has been practically Mr. Scott's executive officer, but Mr. Zimmer denied last evening that Bradley's election would make any change in his duties or position.

TRANSMISSION.

Sonora, Cal.—Lester R. Wiloy has arrived here from Bangor, Maine, to arrange for the installation of an electric power plant to utilize the water from the Golden Rock Ditch in the Groveland district.

Willows, Cal.—At a meeting of the Board of Supervisors recently, a bid was received from Chas. H. Glenn, C. R. Wickes and A. S. Lindstrom for $250 for a franchise to erect poles and wires for transmitting electric power along the roads and highways of Glenn County.

Nevada City.—The Bay Counties Power Co. expects to have its new power line from the Rome power house to the Alaska mine of Pike City, a distance of ten miles, completed during the coming fall, and from that time the pumps and other machinery will be operated by electricity instead of steam power.

San Francisco, Cal.—The Board of Commissioners for the care of the indigent insane of the State of Nevada have invited bids for the construction of a complete electrical power plant and pumping station at the Nevada Hospital for Mental Diseases. Plans and specifications can be seen at the office of the superintendent of the institution. The funds appropriated for the construction of this plant, fully equipped, is $4,700. Bids were received up to August 7, 1907, by the Secretary of the Board, F. L. Wildes, Carson City, Nev.

Sacramento.—The Nevada-California Power Company, which is owned and promoted by many of the stockholders of the California Gas & Electric Corporation, has announced its plans for the complete gridironing of the State of Nevada with high voltage power lines, which will call for the expenditure of more than $15,000,000 and will establish one of the longest power lines in the world. This company now owns much land in Alpine County, California, where it has extensive power generating facilities. From there it will build power lines that not only will supply Reno, Carson, Virginia City, Goldfield, Tonopah, Rhyolite and all of the southern Nevada mining camps, but will reach over into Greenwater and Death Valley copper districts and thence clear across the State of Nevada to Ely and the Cherry Creek mining district with a 100,000 volt line.

ELECTRIC RAILWAYS.

Spokane & Inland Empire System.—250 freight cars to move the grain crops have been delivered from Seattle and Chicago.

Washington Water Power Company.—The line from Cheney to the Medical Lake line connecting the latter with Hayford, Wash., 10 miles, will be opened Sept. 10th. Seventy-pound rails are used.

Northern & Southern Railway Company.—Articles of incorporation have been filed for a concern of Waterville, Wash., with $7,000,000 capital by A. L. Rogers, M. B. Howe, I. W. Matthews and A. E. Case. The object is to build a railroad, either steam or electric, or both, from the city of Waterville, Douglas County, Washington, in an easterly and southeasterly direction and over the easiest and most practical grades from the city of Waterville to the city of Pasco in Franklin County, Wash., 175 miles, together with a feeder for the line in the Moses coulee in Douglas County, 66 miles.

Spokane & Inland Empire Railway.—Jay P. Graves, president, has given out this statement: "We have in contemplation the building of a line from Colfax to Walla Walla, Wash., and the extension of our system from Moscow to Lewiston, Ida. We cannot say when these lines will be built, but they are projected, and if our plans go through, the Inland Island system may be extended to connect both Lewiston and Walla Walla." The line between Rosalia and Colfax has been completed, adding 30 miles to the system. The work occupied 12 months. Grading is proceeding between Palouse and Moscow, 15 miles.

Big Bend Water Power Co.—Mrs. E. P. Spaulding, secretary of the concern, recently appeared before the board of commissioners of Spokane county with a request that changes be made in the plans of the proposed new Le Pray bridge, crossing the river in the northwest part of the county. Mrs. Spaulding said that with the proposed dam which her company plans to build at the gorge below the site of the bridge, the water would be raised nearly 100 feet, and she asked that her company be allowed to join the county in the additional expense of building the new bridge high enough so that high water caused by the dam would not interfere with the structure. Mrs. Spaulding's husband is superintendent and general manager of the projected electric railroad in the Coeur d'Alenes in Idaho.

Chelan Electric Company.—Articles of incorporation have been filed by the concern, capitalized for $500,000 to build an electric line from Wenatchee to the western part of Washington. The officers of the company are: J. T. McChesney, president, and E. C. Mony, secretary. Other trustees are H. P. Scott, of Wilmington, Del., J. A. Coleman and F. H. Brownell. The last named said the route starts at a point near Wenatchee, following the Columbia River to Lake Chelan, thence north to the Okanogan River and from there to the end of the State. Lighting and water privileges for all towns along the Chelan River are included in the articles. There are reports that this is part of the Great Northern Railway Company's plan for the electrification of its system in the Chelan country, west of Spokane.

TELEPHONE AND TELEGRAPH.

Alameda.—The Pacific Telephone & Telegraph Company has its plans almost completed for placing its wires in this city underground.

Coalinga.—The Board of Trustees has finally decided to deny the application of J. N. Wheeler for a franchise for a new telephone system in this town.

Weaverville, Cal.—The government is extending its forest service telephone lines. Forest Supervisor Haffley has been instructed to construct 88 miles of telephone line in the Trinity National Forest Reserve. The line will begin at headquarters in Weaverville and run direct to Harrison Gulch by way of Hayfork and Wildwood, with a three-mile spur to the top of Mount Dubikella. A ten-mile spur will also run from Hayfork to the top of Hayfork Peak. Another line will be built from Hyampom to connect with the North Mountain power line on Grouse Creek. From Cox Bar a spur line will run to the top of Old Ironsides, and when this is completed, a line will be built to Anada.

POWER AND LIGHT.

Pendleton, Ore.—The Blue Mountain Reservoir, Irrigation & Electric Co. has been incorporated with a capital of $5,000 to develop water rights on lower Butte Creek.

Klamath, Ore.—The Southern Pacific is putting a power plant at Spencer's on the Klamath River for generating electricity. The canal will be five and one-half miles long with a fall of 400 feet.

Centralia, Wash.—B. H. Petely, representing Seattle parties, has applied to the council for a franchise to furnish gas to the city for light and fuel purposes. This makes two gas franchises now before the council.

Wallace, Idaho.—Reports from the St. Joe country state that the sixteen dams which have been surveyed above the head of navigation are not to be utilized by the Monarch Lumber Co., but will be built by the Idaho Water & Electric Power Co., which is supposed to be a subcompany of the C. M. & St. P. Ry.

WATERWORKS.

Rio Vista, Cal.—The trustees of Twitchell Island are contemplating putting in a pumping plant at a cost of $5,000.

Biggs, Cal.—Sealed bids are being received by the Board of Trustees for furnishing all materials and for the construction of an auxiliary pumping plant.

Berkeley, Cal.—Within three months the new pipe line of the People's Water Company will be drawing water from the San Pablo and Claremont reservoirs for West Berkeley. The pumping plant at the former station has been installed and is in working order. In order to complete the system in Berkeley, water pipes will be laid along the public streets for a total length of thirteen miles. This will, it is estimated, require two years for completion. The pipes will have a capacity of 1,000,000 gallons of water per day.

ELECTRIC RAILWAYS.

Kalispell, Mont.—W. T. Grier is running lines for an electric tramway between Kalispell and Demersville.

Spokane, Wash.—It is reported that the Washington Power Company will extend the Division Street car line north of Lidgerwood.

Vancouver, Wash.—W. H. Moore, president of the Washington Railway & Power Company., states that as soon as the city system is finished the company will build an electric line to La Center and after that one to Orchards.

Butte, Mont.—Surveys are being made for a street railway up Dublin Gulch, past the Anaconda mine, and through the Gray Rock district, ultimately connecting with the east end of the Centerville line, which, when completed, will extend half a mile east of Main Street.

Idaho Northern Railway.—B. F. O'Neill and E. P. Spalding, president and vice-president of the Idaho Northern Railroad, have placed $1,000,000 worth of bonds of the company, and construction work will be under way soon; the line between Murray and Wallace, 33 miles, will be in operation January 1st. Several branches will also be constructed to handle ores.

Big Bend Light & Power Company.—This concern was incorporated in Spokane, Wash., with $300,000 capital a few days ago, by W. L. Sawyer, D. B. Fotheringham, Harry L. Bleecker and Thomas K. Binnie of Spokane, and Eugene Enlos of Medical Lake, Wash., to furnish light and power to cities and towns in the Big Bend country, west of Spokane. The Washington Water Power Company of Spokane will furnish electrical energy over a high voltage line. The company will also supply power to flouring mills.

Coeur d'Alene-Wallace Railway.—Charles Sweeny, president of the Old National Bank of Spokane and head of the Federal Mining & Smelting Co., announces he is backing the electric line to be built from Coeur d'Alene to Wallace, Ida., for which surveys are being located through the Fourth of July canyon, nearly 100 miles. He said also it would be practical for the road to get electrical energy from the Washington Water Power Company, but he declined to say that such arrangement had been made. The route of the line, he said, is practical. He would not give the names of those interested in the project. The proposed line will have a big tonnage in sawed timber, mining supplies and passengers, and will afford a needed outlet to the Coeur d'Alenes.

TRANSPORTATION

San Jose, Cal.—The San Jose & Los Gatos Electric Railroad Company has applied to the Board of Supervisors of this county for a franchise for an electric railroad over some of the public roads and streets of the county.

Napa, Cal.—The work of installing the high tension wire for the extension of the Vallejo and Napa Valley Electric Railroad Company has commenced. Material for the road is arriving and the track is being built northward as rapidly as possible. It is now completed to within a short distance of Yountville, nine miles from Napa.

TELEPHONES.

Orting, Wash.—The State Board of Control has let the contract to construct a telephone line from here to the Soldiers' Home to Robert E. Lee of Orting.

A publication just issued gives Spokane 11,576 telephones in operation, or 15.35 for every 100 people of a population of 75,000. Other towns in the Spokane country are given as follows: Walla Walla, 21,000 population and 2,286 telephones; Lewiston, 5,000 population, 888 phones; Dayton, 3,000 population, 428 phones; Ritzville, 3,000 population, 425 phones; Colfax, 2,550 population, and 783 phones.

M. A. Phelps, president of the Interstate Telephone Company, has plans in hand to extend the system into the fruit and farming districts, south and east of Spokane, also to the Coeur d'Alene Indian reservation and the lumber and mining camps on the St. Joe River. The company will establish an air line between Spokane and Wallace, Idaho, country roads being used where practicable. A line will also be built to Bonners Ferry.

D. C. Corbin, president of the Spokane International Railway Company, announces that the telegraphone system, recently installed, is to be extended and that connection will be made with the dispatchers' and down town offices. Telephones are depended upon entirely in the movement of trains, the cabooses and passenger coaches being fitted with apparatus, by means of which the trainmen can communicate with the head offices and dispatchers.

One of the most wonderful exhibits to be seen at Madison Square Garden during the Electrical Show will be a 2,000,000 candle power arc lamp elevated on a specially constructed tower in the center of the interior. Recently Mr. Scott, of the Scott Electric Co., inventor of the light, made a successful test with a 300,000 candle power arc lamp in front of the New York Theater on Broadway, and thereupon decided that the candle power could be raised to 2,000,000.

M. McGee, manager of the Nez Perce Co-operative Telephone Company, has closed a deal with the Lolo Telephone Company by which they will connect with the main office at Grangeville. The Lolo company starts in with 30 instruments and will increase this number before fall. The Nez Perce and the Pacific States companies both wanted the Lolo line to connect with them, so the Lolo company held a meeting and the result was in favor of the Nez Perce company, as most of the latter company are farmers from the Nez Perce and Idaho counties.

Spokane, Wash.—The Interstate Telephone Company at Moscow, Idaho, south of Spokane, has been absorbed by the Interstate Telephone Company of Spokane, the transfer taking place Aug. 1st. J. H. Forney, secretary of the Moscow company has resigned, and L. B. Cornell of Spokane has taken charge. C. H. Patten, president, will retire in a short time, being succeeded by M. A. Phelps. E. E. Crandall, acting manager of the Home company, is assistant secretary. The Interstate now has long distance lines in every direction out of Spokane and Coeur d'Alene. The purchase of the Moscow lines gives it entrance into Lewiston and connections with the Nez Perce prairie towns. It will have connection with the Home company in Spokane.

FINANCIAL.

San Francisco.—The Syndicate Oil Co. has levied an assessment of 10c per share, payable Aug. 1st; sale day, Aug. 26th.

San Francisco.—The Direct Line Telephone Co. will hold its annual meeting of stockholders on Aug. 16th, at 501 Leavenworth Street.

Redding.—At the special meeting of stockholders of the Pacific Power Company the following report of the indebtedness of the company was submitted: Open book accounts, ..6959; contract and all indebtedness up to and including January, 1908, $24,172; amount necessary to install the auxiliary plant, to build a pole line to Red Bluff, and supply electricity, $29,100; clerical and managerial expenses, $4,769; amount approximately necessary for six months, $65,000. At this meeting it was resolved to place 150,000 shares on the market among the big stockholders and their friends on the installment plan, the installments aggregating sufficient each month to carry the proposition through to a successful issue, completing the auxiliary plant and placing poles and wires to Red Bluff.

San Bernardino.—A trust deed to secure a bond issue of $500,000 has been placed on record here which transfers to the Los Angeles Trust Co. all the property present and future of the Redlands Central Railway Co., in return for certifying to the bonds, which are to be of denominations of $1000 each, maturing July 1, 1937. The first $100,000 is to be issued at once, the funds thus secured being to pay for right of way, purchasing rolling stock, and, in fact, setting the company, which exists now only on paper, up in business. The road promises to be a rival of the Huntington interests, as concentrated in the San Bernardino Valley Traction and Riverside-Arlington Railway Co. The new road proposes to build into the Yucaipe Valley country, and also to Riverside, and eventually connect with this city.

San Francisco.—The following statement has been sent to the stockholders of the Pacific Gas & Electric Company: "Realizing that it is due to you that an explanation should be made of the necessity for levying an assessment by the board of directors of $10 per share on the capital stock, the following brief account of the company's condition will, I trust, be a sufficient explanation to justify the necessity for said assessment: The Pacific Gas & Electric Company during the calendar year 1906, earned net over and above all liabilities and obligations, including bond interest, sinking funds and debenture retirements, the sum of $690,898.07. For the six months of the present year ending July 1, 1907, it has earned net $674,374.55, or nearly as much as was earned during the year of 1906. From this it is evident that the affairs of the company are in a most prosperous condition from an earning standpoint, and that the surplus upon the above basis should, for the year 1907, amount to $1,800,000. The above net revenue in 1906, and for the first six months of 1907, have been inadequate to take care of the following construction work: First: To rehabilitate the San Francisco system, following the fire of April 18-19-20, 1906; second, to take care of the abnormal growth of the Oakland division, caused by the rapid peopling of that territory; third, in the care of contracts for light and power throughout our entire system, which contracts were made subsequent to April 1, 1906—these principally being in the nature of new cement works, interurban railways and gold dredgers on both the Feather and Yuba rivers. These improvements and extensions in the several plants, made necessary to preserve the integrity of the same, cost approximately $5,750,000. It may be confidently stated that, with the completion of the work in hand, the amount of which is represented in part by the increased debt mentioned, for three of four years to come no extraordinary extension of betterments need be made, and the usual growth of plants can readily be taken care of by the surplus. To pay the present indebtedness, as shown, a plan of financing is now in progress toward a very satisfactory conclusion. Of this, all stockholders will be, in due time, advised. It is considered that with the assessment and the financing, that nearly, if not all, of the entire floating debt can be met, leaving a balance such as a company of this character and importance may at all times be permitted to owe. Yours very truly, F. G. Drum, president."

POWER AND LIGHT.

Trail, B. C.—The by-law granting a five-year franchise to the smelter for electric lighting purposes was carried almost unanimously.

Cashmere, Wash.—City voted to install a municipal electric light plant to cost $13,200. Bonds will be offered for sale at once.

Aberdeen.—The work of driving piles for the new gas reservoir for the Grays Harbor Gas Company has been finished, and work on the building will be started immediately The improvements will cost about $12,000, and will make the plant complete.

Tacoma, Power Plant.—Bids for erecting a municipal power plant were submitted as follows: James C. Drake, steam turbine plant of 4-1,000 kilowatt units, $500,000; extra units, $95,000. Savage Construction Co., steam turbine plant of 3-1,000 kilowatt units, $440,000; extra units, $95,000. Vertical engine plant of 2-2,200 kilowatt units, $550,000; extra units, $125,000. Horizontal engine plant of 2-2,000 kilowatt units, $550,000; extra units, $125,000. Hydraulic plant on upper Nisqually River of 10,000 horse power capacity, $1,750,000.

Seattle.—The Thompson Co., 308 Alaska building, is said to be behind a project to build a $2,000,000 plant on the Nisqually River, furnishing 20,000 horse power, to furnish current for the Felt trolley lines and to manufacturing plants. The plans of the company have been maturing for years. The decision of the Supreme Court annuling the right of public utility corporations to condemn land was recently reversed in a Spokane case, and the company can now acquire land by right of eminent domain. Attorneys are preparing briefs to be filed in court for condemnation of lands along the Nisqually. They will be completed in a few days.

TRANSPORTATION.

Redding, Cal.—F. L. Evans has applied for a franchise for a double track electric railroad through certain streets of this place. In this he is acting for the Eureka & Redding Railroad.

Monterey, Cal.—The City Trustees of this place have declared forfeited the franchises granted the Monterey, Fresno & Eastern Railway Company in Monterey as a result of the failure of the company to begin work on its proposed railway and wharf within the time limit.

San Francisco.—The surveyor's department of the North Shore Railroad Company has completed a map of the proposed cut-off through Wolfe's grade to San Rafael. A surveying party completed a preliminary survey some time ago from Larkspur over Wolf's grade to the junction of Antoinette and San Rafael Avenues, in San Rafael. The new survey calls for a tunnel under the grade.

San Diego, Cal.—At a recent meeting of the City Council three railroad franchises were granted to the San Diego Electric Railway Company. One of these is on Fourth Street, from C to B, and on B from Fourth to the water front, for which the company bid $1,250; one on B, from Fourth to Fourteenth, for which the bid was $1,000, and one on H, from Eighth to Twenty-fifth, for which the bid was $2,500.

San Jose.—The Peninsula Railroad Company has applied for a franchise for a double track railroad of standard gauge on cehtain streets and roads of this county. This company has recently acquired property at Congress Springs and will develop a summer resort at that place. The company is hastening its construction work between Capertino and San Francisco, and is also building a branch line. The track construction is under the supervision of L. H. Long.

Oakland, Cal.—The officials of the San Francisco, Oakland & San Jose railroad have outlined some important extensions of the Key Route system that are to be made soon. These will embrace a new line running up Sacramento Street to Hawkins Street, where the line crosses to the Santa Fe right of way and parallels its tracks for a short distance, leaving them to skirt the base of the foothill slopes along the 400-foot boulevard, by the proposed capitol site. There will also be a spur from Sacramento Street running into the lands of the Piedmont Improvement Company. Another important extension is the new line into Piedmont. This will start at the corner of Fortieth Street and Telegraph Avenue and will run northeast across the intervening country and tap the lower section of the central Piedmont tracks and then cross the upper section of the central Piedmont tracks. It will then cross the upper portion of the East Piedmont Heights section, crossing the proposed city park. The line will then run to Thirteenth Avenue, north of the Fourth Avenue Terrace tract. The entire right of way for this Piedmont extension has been purchased. The extensions to the Oakland Traction lines, which are under the same ownership as the Key Route system, are also of importance. They include: The Grand Avenue line across the head of Lake Merritt and into the lower Piedmont section, the extension from the Fourth Avenue line, the Allendale extension from the Haywards line and a number of extensions in the Berkeley district. The two companies have placed large orders for new cars of heavy type and will replace all light rails with heavy ones. The cost of improvements under way and contemplated is placed by officers of the company at not less than $3,500,00.

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Air Compressors
Henshaw, Bulkley & Co.
Rix Comp Air & Mach. Co.
Hunt, Mirk & Co.

Alternators
Allis-Chalmers Co.
California Electrical Works

Aluminum Electrical Conductors
Pierson Roeding & Co.

Annunciators
California Electrical Works.
Century-Klein Electric Co.
Holtzer-Cabot Elec. Co.
Patrick, Carter & Wilkins Co.
Tel. and Elec. Equipment Co.

Asbestos Products
Johns-Manville Co., H. W.

Batteries, Primary
California Electrical Works
Gould Storage Battery Co.
Standard Electrical Works

Batteries, Storage
Western Electric Co.
Century-Klein Electric Co.
Gould Storage Battery Co.
Electric Storage Battery Co.
Tel and Elec. Equipment Co.

Blue Printing
Dietzgen Co., Eugene

Boilers
Henshaw, Bulkley & Co.
Moore, C. C. & Co., Inc.
Risdon Iron Works
Standard Electric Works
Tracy Engineering Co.
Hunt, Mirk & Co.

Boiler Compounds
Dearborn Drug & Chem. Wks.
Johns-Manville Co., H. W.

Buffers
Northern Electrical Mfg. Co.

Building Material
Johns-Manville Co., H. W.

Building Paper
Johns-Manville Co., H. W.

Circuit Breakers
Fort Wayne Electric Works
Century-Klein Electric Co.

Condensers
O. C. Goeriz & Co.
Moore, Chas. C. Co., Inc.
Rix Comp Air & Mach. Co.
C. H. Wheeler Mfg. Co.

Conduits
American Circular Loom Co.
American Conduit & Mfg. Co.
Tel. and Elec. Equipment Co.
Century-Klein Electric Co.

Conduit Fixtures
American Conduit & Mfg. Co.
Century-Klein Electric Co.
Tel. and Elec. Equipment Co.

Cooling Towers
O. C. Goeriz & Co.
Moore, Chas. C. Co., Inc.
C. H. Wheeler Mfg. Co.

Cross Arms
Century-Klein Electric Co.
Tel. and Elec. Equipment Co.

Dynamos and Motors
Allis-Chalmers Co.
Brooks-Follis Elec. Corp.
California Electrical Works
Century-Klein Electric Co.
Fort Wayne Electric Works
General Electric Co.
Holtzer-Cabot Elec. Co.
Northern Elec. Mfg. Co.
Standard Electrical Works
Tel. and Elec. Equipment Co.
Westinghouse Elec. & Mfg. Co
Wagner Elec. Mfg. Co.

Elevators
Van Emon Elevator Co.

Electric Car Heaters
Johns-Manville Co., H. W.
Northern Electrical Mfg. Co.

Electric Grinders
California Electrical Works
Northern Electrical Mfg. Co.
Tel. and Elec. Equipment Co.

Electric Heating Devices
Johns-Manville Co., H. W.

Electrical Instruments
Cutter Co., The
Century-Klein Electric Co.
Fort Wayne Electric Works
General Electric Co.
Tel. and Elec. Equipment Co.
Westinghouse Elec. & Mfg. Co.
Weston Elec. Instrument Co.

Electrical Machinery
California Electrical Works
Northern Electrical Mfg. Co.
Standard Electrical Works
Century-Klein Electric Co.

Electric Polishers
Northern Electric Mfg. Co.

Electric Railway Appliances
Pierson, Roeding & Co.
Johns-Manville Co., H. W.

Electrical Supplies
California Electrical Works
Century-Klein Electric Co.
Standard Electrical Works
Tel. and Elec. Equipment Co.

Electric Ventilating Fans
Century-Klein Electric Co.
California Electrical Works
Northern Electrical Mfg. Co.

Engines, Boilers, Heaters, etc.
Allis-Chalmers Co.
Henshaw, Bulkley & Co.
Moore, Chas. C. Co., Inc.

Electric Watchman's Clocks
Tel. and Elec. Equipment Co.

Engineers, Chemical
Smith, Emery & Co.
Moore & Co., Chas. C., Inc.
Standard Elec. Works
Tracy Engineering Co.
Westinghouse Machine Co.
Hunt, Mirk & Co.

Engines, Gas and Gasoline
Allis-Chalmers Co.
Henshaw, Bulkley & Co.
Moore & Co., Chas. C., Inc.
Westinghouse Machine Co.
Hunt, Mirk & Co.

Engineers and Contractors
Brooks-Follis Elec. Corporat'n
Byllesby & Co., H. M.
California Electrical Works
Cannon, Edward F.
Hunt, Mirk & Co.
Century-Klein Co.
Copeland, Clem A.
Doble Co., Abner
Doble, Robert McF.
Cory, C. L.
General Electric Co.
Hunt, Dillman, Meredith & Allen
Jackson, D. C. & W. B.
Smith, Emery & Co.